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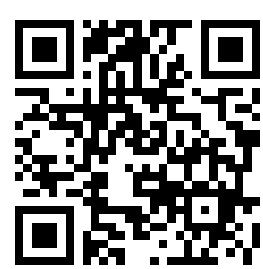

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The American Idea.

The munificent money gifts recently acquired by several of the large American colleges through the generosity of the late H. C. Frick, and the $2,000,000 Christmas gift made by Mayor Couzens of Detroit, Mich., to Detroit charity organizations serve to call attention to a common attitude of wealthy Americans in regard to the disposition of their money accumulations that is worthy of more than passing notice.

Socialism, in its ideal—and more worthy aspects—contemplates free education for every boy and girl, and free treatment for all bodily ills.

Unquestionably social betterment is largely dependent upon a wide dissemination of the facts which constitute useful knowledge. Also it is true that health and physical well-being are real essentials bearing upon the advancement of the race.

The socialistic idea is that these things should be brought about at the expense of all of the people. This is right—and good. But all past experience with movements looking to social betterment, where a share of the expense is to be assumed by every individual, indicates that it would take a century or two to prevail upon a hundred million people to become enthusiasts in the undertakings here considered.

The question is always present whether it is not better that men who start as day laborers, and who, due to the opportunities of our excellent American system of individual initiative, in a comparatively few years pile up large fortunes; be encouraged to continue as they have been doing and at the end of their brief span of years turn over their money accumulations to educational and charitable institutions.

The "nigger in the woodpile" suspicion years ago attached to University endownments by a class envious of every dollar that does not directly reach its own pockets no longer has considerable weight. The bequests of money to hospitals and other reclamation charities have about kept pace with the bequests to colleges. Here, surely has been no thought of influencing or diverting proletarian aspirations. The donors could as easily have endowed institutions of propaganda whose objects would not long have remained matter for difference of opinion.

Further, many of our finest public art museums exist as everlasting monuments to the energy and thrift of individual Americans. And in view of the knowledge that it takes centuries for the mass of the people to advance even a few steps along any given lines of betterment it should be plain that we are today much richer in beneficent facilities as a result of individual accomplishment than we would be were there no such thing as reward for personal industry and effort.

In its most sordid aspects Socialism would make of us a Nation of wanters rather than a Nation of givers. To a less extent this tendency exists where millions of people have around them institutions of learning and of culture whose facilities they are free to use without the wholesome requirement that they should be paid for by work done; but there is this difference, that the institution itself stands as a monument to the individual industry of some man who concentrated his genius upon the task of piling up a fortune which in its entirety might be applied to a given purpose.

By this system astounding progress has been made in a minimum of time, and ideas contemplating the greatest good to the greatest number are better served when individual reward is freely accorded individual effort.

The Good Book says, "It is more blessed to give than to receive," and if our common aim is to become a Nation of givers rather than a Nation of wanters human destiny will hold out splendors for us all.

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PRINTING TELEGRAPHS

NEW AND SIMPLE PRINTER FOR WAY CIRCUITS NOW BEING DEVELOPED

(Paper delivered by Sterling Morton at recent Chicago meeting of Railroad Telegraph Superintendents.)

The development of printing telegraph systems in the United States to the present time has had in view apparatus which produces its record in page form. European practice, on the other hand, is largely inclined towards the production of a continuous tape. Therein lies a fundamental difference between American and European printing telegraph practice of today.

The basic principle of practically all successful systems both here and abroad, has been the utilization of the so-called Baudot or five-unit code. The permutations of the five units, either of which may be of two kinds, give thirty-two combinations. In American practice these combinations are used to give the twenty-six letters of the alphabet, space, blank, two shifts; that is, from lower case to upper case and return, the carriage return signal, which starts a new line and the line space which lifts the paper. You can see how considerate of telegraph inventors the ancients who developed the alphabet were. Had they decided on forty or fifty letters, the problem would have been complex indeed.

In usual practice, the line signals; that is, the impulses sent over the line, are either positive or negative, although in some cases current or no current intervals are used.

Great efforts had been made by scores of inventors through many years to perfect apparatus utilizing the five-unit code, but the chief stumbling block had always been the almost impossible task of keeping the receiving apparatus running in absolute synchronism with the transmitter. Various methods have been used and present European systems depend to a large extent on the use of brakes. These are very delicate and difficult to adjust and for this reason are not entirely satisfactory. The Western Union multiplex uses a tuning fork and a phonic wheel giving very close regulation, which is further improved by an ingenious method of moving the brush-holding arm of the receiving instrument. In this way a constantly corrected synchronism is obtained and excellent results are secured. The apparatus, however, is highly complex and expensive to install and maintain, so that its use may reasonably be said to be advisable only on heavily loaded circuits in offices where the amount of apparatus justifies the employment of highly skilled mechanics and the installation of proper repair facilities. As it is, however, a large percentage of the trunk line commercial telegraph business of the country is handled on these instruments with excellent results.

The fundamental reason for the use of multiplex is that the normal speed of typists limits the output of a circuit to about sixty words per minute. At this speed the frequency of the signals over the line is below the capacity of the line to transmit such signals clearly. In order to utilize more fully the transmitting possibilities of the line the multiplex was devised.. Its distributor is basically a switching device which switches the line current from one to another of as many as four sending and receiving units in turn. Each quadrant has the proper segments for receiving the varying impulses which result from the permutations of the code. In this way the ability of the line to transmit messages is multiplied as many as four times, resulting in very high traffic volume.

For more highly loaded circuits the single duplex apparatus has been devised. There no attempt is made to obtain more than approximate continuous synchronism between the sending and receiving stations. The brush arm at the receiving station is set to run somewhat faster than that at the transmitting station, and synchronism is maintained only during the transmission of one letter. The receiving brush arm comes to a complete stop after making one revolution for receiving one letter. It is started again by a release signal from the transmitting station. Variation in speed between the two is not so great but that a sufficient synchronism may be maintained during the time of transmission of one letter which, working at sixty words per minute, is one-sixth of a second.

Investigation has shown that there are very few railroad circuits which have anywhere near the traffic load to justify the installation of more than a single duplex printer circuit. However, a comparatively simple two-channel system having a speed of 120 words per minute in each direction has been developed and is now available for general use.

It is important to bear in mind that automatic units are highly interchangeable. For instance, each terminal of each duplex or each single terminal of one channel of multiplex transmission requires a printer, a transmitter and a perforator. These units are the same for either of the systems, only the line signaling apparatus being different.

There was an interesting discussion here last year as to the amount of traffic required to justify the installation of printing telegraph systems. As I remember, Mr. Cellar of the Pennsylvania Railroad took issue with some of the other members and a rather lively argument ensued. To tell the truth, it is very hard to set any definite number of messages as the minimum for printer work, because conditions vary so widely. For instance, if

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we say it will take 500 messages per day between two points to justify the first printer circuit because of the expense of a mechanic at each terminal, in addition to a sending and receiving clerk, a second circuit between these two points may be put in on a much smaller number of messages because no more mechanics would be required. In the same way, a line having one terminal at a point equipped with printer service and another terminal at a new point can be operated on a much lower volume of traffic than the original installation; and again, the third side of the triangle that is then created can be profitable on a still smaller message traffic. Modern practice is to use perforated tape on page printer systems; for, although it is theoretically possible for the operator on the direct keyboard to transmit to the full capacity of the sending and receiving mechanisms, in practice this is rarely done. Each little interruption, to check a message, to decipher a poorly written word, or any other diversion of attention, means a loss of line time.

The tape operator may prepare tape rapidly but the transmitting instrument will send it out at the set speed only. During interruptions the machines will continue to operate at the usual rate until the loop of tape between the perforator and transmitter is used up. Thus the work is rendered much easier for the operator as it does not impose the nervous strain of constant close attention to the keyboard and a net gain in messages transmitted is secured, sufficient to more than cover the slight cost of the tape.

It is interesting to note that practically the entire news distribution service of the city of New York is at present handled by automatic means, one station serving as many as twenty-five receiving stations. The news associations use printing telegraphs for long distance transmission as well, with excellent results, and every day brings forth new adaptations of this service.

The ever increasing cost of line construction and maintenance furnishes one of the best arguments in favor of printer service. Cases have come to my knowledge where printer installations have saved railroad companies from the necessity of building additional facilities.

I believe that under conditions obtaining during the war it would have been impossible for one of the leading telegraph companies to have built new wire facilities fast enough to handle the increased traffic, and that had it not been for the automatic systems, the congestion would have caused serious delays in the work at home which was so effective in the winning of the war.

Railroad telegraph work varies widely from commercial telegraph work, in that so many of the railroad lines are used largely for both telegraph and telephone. It has been found in practice that it is possible to maintain a speed of approximately forty words per minute in each direction with printer circuits on such wires. Higher speeds will cause interference. This subject has had careful study, and, provided there is not too much telephone apparatus on a circuit, it is possible to obtain satisfactory composite operation.

I mentioned before that the telegraph traffic load of railroads at present hardly justifies the cost of installation of the multiplex system Large railroads probably have several circuits on which the load is sufficient to warrant the installation of the single duplex systems, but the total of such lines is small compared with the stations which handle fifty to 100 messages per day. Most of these stations are connected in series on a way wire. The condition is now being met in the development of printers with an installation and maintenance cost to justify their use on circuits having fifty messages or more per day. Such apparatus is now in production and will be available within a very short time. It is very simple, both electrically and mechanically.

The principal complication in printing telegraphy is the necessity of paging the copy, that is, arranging to move the paper or the printing mechanism from left to right, then return it to start a new line, and at the same time move the paper up. Any instrument which will do this and at the same time operate on a simple line signal over a single wire must be expensive, rather complicated, and need expert attendance. However, if this page feature can be eliminated a comparatively simple system can be devised to work on the signals used for the page printer and print its record on a ribbon like that of a ticker.

As I mentioned in the foregoing, European practice has always favored the tape record. Copy is received in one continuous strip and in some cases is delivered in that form. Where it seems advisable to use a blank form the tape is cut and pasted. Those who have had experience with European telegraphy are no doubt familiar with their methods. When the operator makes a mistake, he merely sends an "erase" signal and corrections are made by the receiving operator who merely tears out the incorrect tape.

Any standard railroad forms may be used with tape reception, as the message may be cut and pasted to fit. The only local power requirements will be current, either A. C. or D. C. sufficient to operate a small motor. The machines may be installed in series along a line and operated continually, receiving all that is sent over the line, or any station may be called by selectors and plug in. In case of a general order all stations may be switched in and the same message received by all. As the machine makes a printed record, the advantages of such a system over the telephone for dispatching and train orders is at once apparent, as misunderstandings, especially of figures, are eliminated.

The present wide use of printing telegraphy justifies the conclusion that it is commercially practical and destined to play a large part in the communications of the world.

There is practically no kind of communication problem which has not been studied with a view to the use of printing telegraphy, and there are very few problems indeed which will not be economically solved by it.

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TELEGRAPHING BOATS THROUGH CHANNELS AND ALONG COASTS

AN ELECTRICAL SIGNALING METHOD FOR GUIDING CRAFT

By R. H. Marriott.

It is evident that vessels have not had means for sufficiently accurate guiding in narrow channels, dangerous channels, and in fog. Largely for this reason many vessels have been lost or delayed. For example, one hundred and sixteen vessels have been lost in Alaskan waters north of Ketchikan. Many vessels are held up for considerable periods of time at harbor entrances; for example, at New York harbor entrance, where the financial cost of delay may amount to as much as $500 per hour for one vessel. It is believed that recurrence of such losses may be prevented by the following method:

Install a signal-carrying conductor along the sides of the channel or under the channel and pick up the signals on the vessel. For example, when conductors are on each side of the channel, guide the vessel so the signals from the starboard conductor are slightly louder than those from the port conductor. When two conductors are under the channel, one for inbound and one for outbound, keep the inbound vessel in the course that gives loudest sound, indicating the inbound guide. The under-channel guide would probably be more practical.

The ship receiving device may consist of a coil of wire on an iron core attached to the bottom of the ship with the core athwartship for receiving from a submarine signal wire or vertically to the side of the ship for receiving from a wire parallel to the channel. The winding of the coil may be connected to a pair of telephone receivers worn by the helmsman or navigating officer, or one pair of 'phones for each of the officers.

Where conditions will permit the signal may be the spoken word "In" for the inbound channel, and "Out" for the outbound channel.

If desirable and conditions permit, different frequencies of alternating or pulsating current may be impressed in the guide conductors: One frequency for inbound and one for outbound. These signals may be picked up by both telephones and a signal-strength-indicating device, such as a sensitive ammeter or galvanometer in a circuit resonant to the frequency of the current impressed on the guide conductor.

With two or more such indicating devices, the relative strength of the fields of the inbound and outbound signals and the relative strength of fore and aft and athwartship fields may be ascertained. Also, by controlling the strength of the signal in accordance with the distance from a given point; say, by grounding a portion of the current through suitable resistances at points fixed distances from the source of supply, the strength of signal would be relative to the distance from that source. Such indications of strength of signal relative to the source of supply (*e. g.*, the dock) and relative to the inbound and outbound signal conductors and relative to the angle the ship makes with the signal conductor, offer the means for a relatively high degree of accuracy in steering the vessel clear of danger.

A further complexity of circuits may be provided which will afford sufficient accuracy in certain places. The guide may consist of several conductors in one cable, the conductors being of suitable lengths and suitable speech currents being impressed on them. One conductor could carry a speech current which says periodically "One mile in," while the next in length would say "Two miles in," while the outbound signal wire in that vicinity might say "Nine miles out."

The ship's receiving circuits may be arranged fore and aft and athwartship in such manner as to indicate whether the ship is approaching the signal conductor or leaving it, or is parallel to it or at some angle to it.

Structural conditions of ships, channel conditions, financial and political conditions have their bearings on what structural arrangements would be best to carry out the method.

In New York harbor it would probably be entirely practicable to provide all possible refinements and strong, accurate signals which could be followed by vessels equipped with the more simple, inexpensive apparatus and those which might be equipped with more expensive and more highly accurate apparatus.

In the long passages in Alaska it may be practicable and sufficient for the present to follow the Army cable lines. This may be made possible by picking up the telegraph signals and guide signals which might be supplied by the Army in intervals between telegraph signals. To do this is more difficult than would be the case if the cable were made for directing purposes, because Army cable currents are weak and the cable is covered with a sheath containing iron. Also, the resistance, inductance and capacity of the long cables limit the quantity and kind of signals that may be impressed on them.

However, there are several ways which can be used as may be necessary to pick up the weak cable signals, although they are in an iron sheath.

For example, the pick-up circuit (which can be relatively small) may be lowered from the ship to near the bottom and maintained in the same rela-

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tive position to the ship; also prescribed frequencies may be used on the cables and tuned receiver circuits, and very weak currents may be amplified.

The receiving or pick-up circuit may include a coil virtually wound around more or less of the hull. One coil could be wound in a fore and aft plane and another in athwartship plane, or a coil or coils inside or above the hull, depending on practicability.

Increasing the efficiency of the pick-up coil, increasing the current in the signal wire, and increasing the amplifiers, all serve to increase the possible distance.

Only one signal conductor can serve. If vessels are to pass to starboard in a channel, two receiving circuits (port and starboard) may be used, and the vessel steered so the sound is always louder on the port side.

Portions of the guide conductor may be inclosed in iron for reducing the signal strength at desired points or for desired sections. Such arrangement might prove desirable for certain of the conductors where several conductors are used. One conductor might have the words "Port ninety" for a sharp turn, and be in iron beyond the turn.

A first-rate, well protected signal cable containing more than one conductor would probably cost a dollar a foot, laid. Less expensive cables could be laid, however, depending on the depth of water, the channel currents, and whether the bottom was soft or abrasive.

It may be desirable to make the incoming and outgoing guide conductors into a circuit, instead of having a ground return for each, or it may be desirable to have a common metallic return conductor for both. The return conductor might be bare wire. Some conditions might permit the use of a bare wire conductor on shore on insulators with a return bare conductor circuit under water, the bare conductor being of such low resistance that it would be the principal current path, and so serve as a guide, cheaper than where under-water insulation was used.

The signal current in the conductor along the channel may be like that in the antenna of a radio transmitter and the radio receiving outfit on shipboard may be used to receive it, using a regular antenna or a coil. Also, the coil might be revolvable on its axis so it could be turned to pick up the signal and then turn the boat so it had the proper fore and aft position relative to the coil, and therefore be headed right in the channel.

At this date, it is pretty hard to say what is the most practical arrangement to use to suit conditions. It may be best to go along the lines of making the best direction control apparatus irrespective of the radio apparatus, and leave the radio apparatus free to handle other things, or it may be best to impress common radio frequencies on the signal conductor or load the antenna for lower frequency so that all vessels equipped with radio could tell when they were closest to the conductor by the strength of the received signal. The Alaska cable is probably not suitable for using radio frequencies.

Also, the use of the common radio frequencies in the guide conductor might interfere with some stations which did not want to receive direction signals, but did want to receive messages from some station, and it is easier to build under-water conductors for longer wave lengths.

Fifteen thousand meters is about as long a wave length as any kind of a radio station receives at present. Therefore, we might go to a little longer wave length, that a ship's antenna could be loaded up to, and which a closed coil could be built for, and would be revolvable for getting the direction not only of this conductor but of radio stations. All of which could be received on detectors if interrupted properly.

Suppose we take 20,000 meters, which corresponds to a frequency of 15,000 cycles. Fifteen thousand cycles is audible, but our ears do not pick it up so well, or we think they do not. Training might make 15,000 cycles a practical frequency to listen to.

Fifteen thousand meters probably could best be impressed on a submerged insulated wire about 3,000 meters, or two miles long if the wire was grounded at the one end, probably the end near the transmitter generator. That frequency probably would do well in even longer wires or a succession of wires one mile long inductively or otherwise coupled at the ends, in which case the ship in passing over the points of coupling would note differences every mile, whch would be used as a measure of distance and further contribute in the matters relative to location.

All things considered, possibly the most practical form for common service would include a standard frequency for all ocean going vessels and for all ports, of say 750 cycles, and enough current in the signal circuit so the receiving circuit would not necessarily include anything but a revolvable coil on top of the pilot house, a fixed condenser and a pair of 'phones with an indicating dial and coil-turning handle in the pilot house..

Such a frequency is applicable to quite long wires, and long wires might be required in some places. Also, such a sinusoidal frequency and current can be fairly easily obtained from a dynamo and maintained with very small percentage variation. And such a receiving coil and condenser and 'phones can be maintained comparatively constant.

Sinusoidal current and the frequency of 750 or 1,500 would serve to cut out some interference, those frequencies being different from the commercial 60 cycles, radio generator 500 and 1,000 cycle frequencies, and seem to be sufficiently different from common motor and dynamo commutator and field frequencies. The average ear is probably most sensitive to about 750 cycles, but quite sensitive to 1,500 cycles.

Special vessels (e. g. ferries) which do not use regular channels, probably should be provided with

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additional special frequencies. On the Alaska cable route, special very low frequencies, may be twenty cycles or less. It might be found that the longest Alaska cable run has a minimum impedance for a frequency of four cycles or less.

For airships, airplanes, etc., the guide conductors probably could be established on existing pole lines and suitable frequencies used with certain dot and dash signals as for water craft, or by use of amplifiers speech signals might be impressed on the guide wires, modulating direct current or some suitable alternating current to which the airship guide receivers or other receivers were tuned.

There seem to be sufficient applicable forms, modifications, and combinations to provide a standard arrangement for each group wherein the service and service conditions have a sufficient number of common characteristics.

With the above descriptions and discussion a brief description of one experiment is probably sufficient and preferable. The following experiment for example:

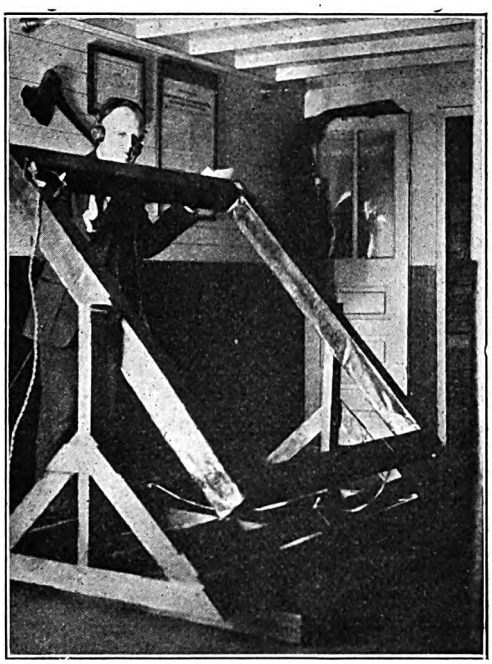

FIGURE 1.

A 4000 c.m. rubber covered wire about 700 feet long was dropped over and along the side of a dock into the water. One end of the wire was bare and in the water, the other end was brought up on the dock and connected to one side of the "break" on a buzzer. The other side of the "break" was connected to the water. Five dry cells were used to operate the buzzer. The wire along the dock under water and the ground return showed a bridge resistance of about 5000 ohms. The predominant frequency produced by the buzzer corresponded to about 1200 cycles. The rubber covered wire in the water was intended to correspond to a short guide conductor in a channel, the center of the channel being along the dock.

The receving device consisted of a wooden frame four feet square wound with two coils of No. 28 D. S. C. wire The coils were side by side, separated by about 4 inches, each coil having a winding space cross section of about 1/2 inch diameter. The coils were connected in series and had a resistance of about 1,000 ohms and inductance with 'phones of about 10 henries. There were about 1,000 turns. A variable air condenser of .005 max. capacity and a pair of 2,200 ohm 'phones were connected in series with the coil.

Wearing the 'phones and carrying the condenser and coil the length of the dock with the coil vertical to the dock and its lower 4' side parallel to the signal conductor; the buzzer signals were sufficiently loud to be easily heard above the noise from riveters near the dock, the wind and induction from commutated circuits, etc.

A tug, with steel hull and deck houses, was lying beside the dock, its side being directly above the signal wire. The receiving apparatus was taken on top of the pilot house and the same results ob-

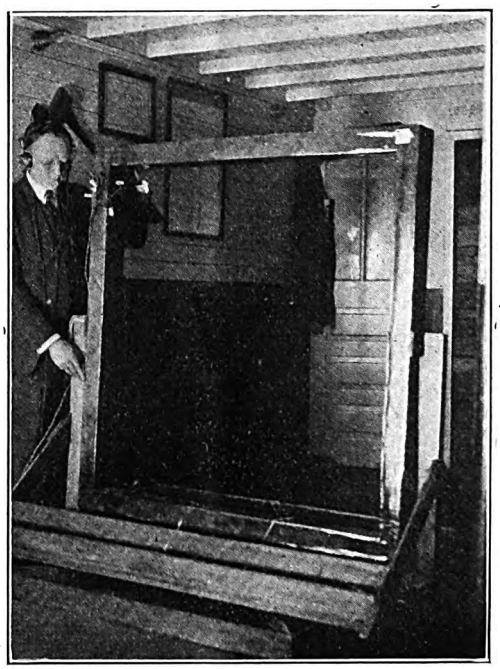

FIGURE 2.

tained, tipping the coil to indicate on which side the conductor was located.

The signals fell off as the coil was revolved away from parallel to the guide conductor No buzzer signals were heard when the plane of the vertical coil was at right angles to the conductor.

The signals could be tuned in or out by adjusting the condenser.

The above experiment can be easily duplicated or approximated and should indicate that a tug can be accurately guided by this method in a channel which is deep enough for a tug. And the experiment, together with the previous descriptions, probably will indicate to those experienced in radio telephone, or alternating current electrical engineer-

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ing, that the method with suitable variations, somewhat as outlined, can be applied to various service conditions over comparatively great distances.

The harbor guide circuits should be so constructed, maintained, and operated, as to guarantee uniformity and reliability. Therefore, their construction, maintenance, and operation should probably be defined by Federal law as soon as sufficient experimental and development service has been rendered to indicate just what complete arrangements will render the maximum service. Too early definition by law might serve to handicap development.

Development by different private companies and by government departments would probably result in a number of different forms and installations which would later have to be standardized into certain lines of uniformity to render the best service.

FIGURE 3.

Probably the method for development and application which would provide the most efficient service in the shortest period would be for some department of the government to provide a special organization for this work, under appropriations from Congress.

The business of this organization would be to simultaneously study the service requirements and carry on experiments and developments with apparatus of government design and such as might be purchased from private interests that might give their attention to this work, the development experiments then to be followed by the establishment of permanent standard guide circuits and by laws and international arrangements as necessary, probably leaving the supplying of suitable receiving apparatus to private concerns which might rent or sell them to the steamship companies operating under various flags.

Radio compass stations are already being established. These can be used to guide vessels to the harbor entrances, where the guide signals could be picked up and followed through narrow or crooked channels and past outbound vessels without seeing channel markings or the vessels, and without having previously navigated that channel.

New Radio Call Book.

The Consolidated Radio Call Book, which contains 2,500 calls in addition to those listed in the Berne Bureau's call book of April, 1918, is now ready for distribution. The book will be of great value both to the amateur as well as the professional radio operator. In addition to the complete list of radio ship and shore station calls of all nations the book contains a large amount of information relative to radio traffic handling, rates, etc. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, at $1.00 per copy.

Radio Buzzer Sets.

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $3.50 for the set.

VACUUM TUBES IN WIRELESS COMMUNICATION. By E. E. Bucher. Pages (6x9 inches) 174; illustrated. New York, August, 1918.

Mr. Bucher, who is instructing engineer, Marconi Wireless Telegraph Company of America, in the present work presents a volume which shows over one hundred different circuits for the practical use of vacuum tubes as detectors, radio or audio frequency amplifiers, regenerative receivers, beat receivers and generators of radio frequency currents.

A series of graphic charts in the appendix explains the functioning of the vacuum tube in an elementary manner. The technical introduction reviews the problems of continuous and discontinuous wave transmitters and receivers.

The book is ably written and the illustrations are clear and understandable. Telegraph students and engineers will find written in its pages a great amount of radio information along lines that are certain to be of importance in the operation of radio systems of the present as well as the future.

The price of this book is $1.75 and copies may be obtained by making remittances payable to John B. Taltavall, publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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BUILDING A CAREER ON FAITH.

By Edward Julian Nally

There is a foundation stone to each man's success in business. In my personal experience this is represented by the first of the familiar graces, Faith, and with it is coupled concentration of purpose and energy.

In the years of youth opportunity is a secondary consideration; confidence is the important thing. My start was inauspicious. I began as a messenger boy. But I held firmly the conviction of success, even then; and this confidence never left me.

It is in Faith that courage is born. And thus is bred Hope, the energizer of work. Finally, out of work—constant, tireless, unremitting, is the fabric of achievement woven,

Definite objectives must be sought, and perpetually striven for, one by one, with each attainment the compelling force for the next. Always, there must be a single aim, and concentration upon it.

In commercial life this objective is usually the job higher up, and it is always waiting for the boy who has utilized his spare moments to acquire knowledge outside the prescribed limits of his own routine duties; to familiarize himself with details of work regarding which he is not compelled to be informed.

The boy who is paid fifty dollars a month and earns what he gets, and no more, is the boy who sticks in a fifty-dollar position and is not advanced on the payroll. On the other hand, the boy who draws only fifty dollars but works as if he were being paid eighty is invariably the one to be chosen for promotion to the eighty-dollar place.

Jealousy of holidays and off-hours indicates in a boy the presence of the microbe of failure. The men who are given to signing petitions and round robins also betray the same defect. They petition for opportunities instead of making them.

If I would lay emphasis on one thing more than another, it would be obligation to duty, duty to one's self and to those about him; and, in the simple words of the Good Book, "Leaving nothing undone, and doing all things well, missing naught."

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THE MORKRUM PRINTING TELEGRAPH SYSTEM

FULL DESCRIPTION OF OPERATION

Fifth Article.

(Continued from December 16 issue.)

There is a slotted lug on the front edge of each plate. One of the drum shafts passes through these slots. Thus the amount of rotation of the plate is controlled by the length of the slots, which is the same for all plates.

Projecting through the trip rod bracket in the line with the upper end of lever E is a trip rod. A notch in the rear end of this rod is normally engaged by a trigger. When the trigger disengages the trip rod, the spring G presses the trip rod against the upper part of lever E, overcoming the tension of the spring F acting against this lever and rotating the plate in a clockwise direction as far as the slot in the lug permits.

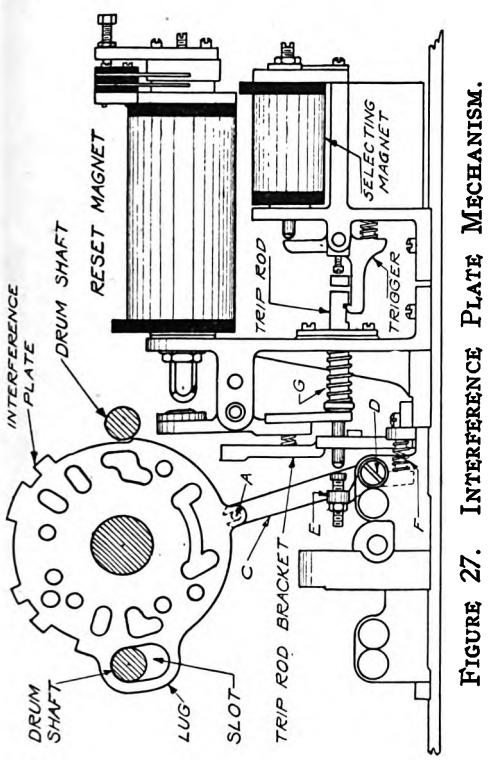

FIGURE 27. INTERFERENCE PLATE MECHANISM.

Trip Mechanism.—The triggers are disengaged from the trip rods by the operation of the selecting magnets, mounted directly behind the triggers. When a magnet is energized, its plunger is driven forward, striking a trigger and knocking it out of engagement with its trip rod. The spring G, which has been held compressed, now moves the trip rod forward against lever E, thus rotating the corresponding interference plate.

Fourth Pulse Contact.—As before mentioned, the interference plates of the selector correspond to elements 1, 2, 3 and 5 of the code and are operated by selecting magnets 1, 2, 3 and 5. Selecting magnet number 4 is exactly similar to the others, and its operation also releases a trip rod. This trip rod, however, instead of actuating a plate, closes the fourth pulse contacts. (*Figure 29.*)

Reset Mechanism.—After the plates have been set for any combination and the drum has completed its travel, the selected pins which have passed through the openings of the plates will hold the plates in this setting until the drum is restored to its normal unoperated condition. This being the case, the trip rods may now be reset.

The Reset Mechanism consists of a long pivoted armature mounted vertically and actuated by a reset solenoid (*Figure 29*). On each of the trip rods is a collar C. When the reset solenoid is energized it presses the top of the reset armature forward. This causes the lower edge of the armature to move backward and press against the collars of any of the trip rods which may have been tripped, forcing these rods backward until the notched ends are again engaged by the triggers, which hold them in position ready to be actuated again by the selecting magnets.

Sixth Pulse Contacts.—Mounted on the reset armature is a contact screw, known as the sixth pulse contact (*Figure 29*). When any of the trip rods are released, the collar C strikes the lower part of the reset armature and moves it forward, causing the contact screw to press against a contact spring. This establishes a circuit to the sixth pulse relay. It is obvious that when the reset solenoid operates the sixth pulse contacts are opened.

Reset Contacts.—The reset contacts are mounted on the rear end of one of the reset coils. Attached to the plunger of the reset solenoid, is a vertical arm, carrying an adjusting screw. When the reset magnet operates, this adjusting screw, striking the longer of the two contact springs, closes the contacts. (*Figure 30.*)

Spacer Mechanism.—The Spacer Mechanism moves the carriage, which carries the typewheel, after each letter has been printed. Mounted below the carriage and parallel to it are two racks or notched bars. Pivoted to the carriage casting are two pawls, the holding pawl and the spacer pawl, which are held by springs against the faces of the two racks.

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One of the racks is stationary, but the other rack can move to the right or left within certain limits. Attached to the movable rack is a spacer lever, and the spacer solenoid is so mounted that when it operates its plunger pushes against this lever and moves the rack to the left. This movement is just sufficient for the spacer pawl to be lifted out of one notch of the movable rack and dropped into the next notch. When the current to the spacer solenoid is cut off, the spacer spring, acting against the spacer lever, causes the rack to move to the right.

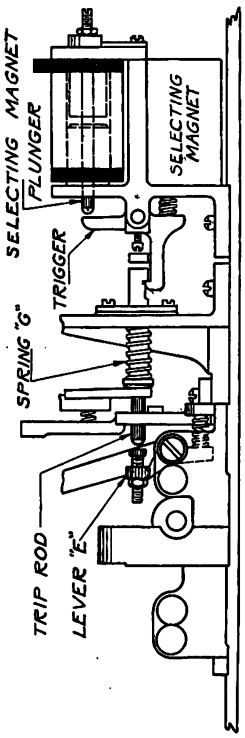

FIGURE 28. TRIP MECHANISM.

This movement advances the typewheel carriage the space of one letter. When it has moved this distance, the holding pawl drops into the next notch of the stationary rack and prevents the carriage from dropping back when the movable rack is again actuated by the spacer solenoid.

Carriage Return Mechanism.—Between the two racks is mounted a bar, which is moved upward when the carriage return solenoid is operated. When this bar moves upward it strikes two projecting lugs, one on each of the pawls attached to the carriage, lifting these pawls out of the notches of their respective racks and freeing the carriage.

A cord attached to the left side of the carriage casting passes over a pulley and around a spring barrel at the left hand end of the printer. When the carriage pawls are released, the tension of the spring in the carriage return barrel quickly winds up the cord and thus draws the carriage back to the left hand end of the line.

To hold the pawls off the rack until the carriage has fully returned, a locking pawl is attached to the movable spacer rack. When the carriage return bar is lifted by the carriage return solenoid, a projecting stud in this bar slips into a notch in the pawl, holding the bar in its extreme upper position and the carriage pawls off the racks.

When the first letter of a new line is printed, the spacer magnet operates, moving the spacer rack to the left. This movement of the rack also moves the locking pawl to the left and allows the stud in the carriage return bar to disengage. The carriage return bar drops, and the two pawls attached to the carriage casting again engage the racks and perform the spacing function.

Carriage Buffer.—The air buffer shown in Figure 33 is provided to absorb the momentum of the carriage as it returns to the beginning of the line. When the carriage is a short distance from the carriage stop, it strikes the buffer lever, forcing the piston into the cylinder against the pressure of the air, which escapes through the small adjustable outlet. Thus the carriage is prevented from slamming against the carriage stop.

Centering Mechanism.—The typewheel is returned to its normal position after rotation by the following means:

A centering spring lever is fastened to the rotator shaft. Two opposed springs are connected to this lever so that if the typewheel is rotated, one of the springs will contact while the other will be extended.

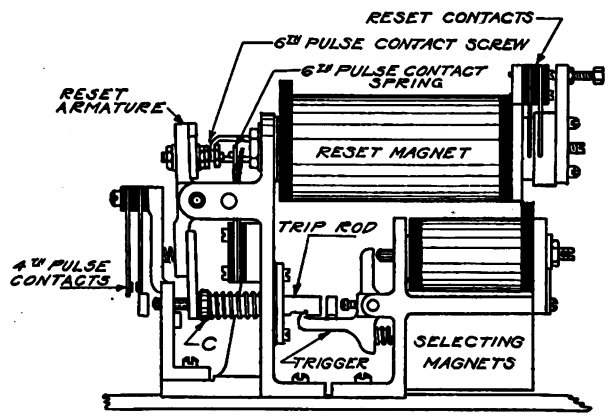

FIGURE 29. FOURTH AND SIXTH PULSE CONTACTS

When the rotator magnet releases, the spring which has been extended will pull the spring over to a vertical position. Since the gear shaft is controlled by the rotator shaft through the gear segment and pinion, the index arm will also be brought back to a vertical position and the typewheel to normal.

To more accurately determine the vertical position of the index arm, an auxiliary means is provided which only acts when the index arm is nearly in its vertical position. On the gear shaft between the right end bearing and the index arm is a centering cam. Two centering pawls joined together by a spring are held in such position that if the index

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arm rotates to the right, the projection of the centering cam which moves with it will raise the end of the left hand centering pawl, stretching the spring. It is obvious that this spring exerts a force to bring the index arm back to its vertical position when the index arm is released. If the index arm rotates to the left, the right hand centering pawl acts in a similar manner. If the index arm rotates very

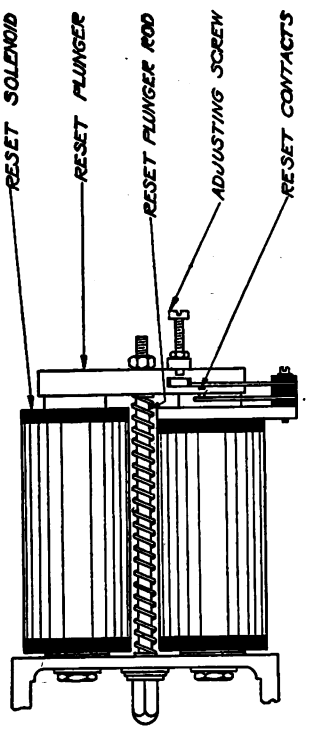


FIGURE 30. RESET CONTACTS.

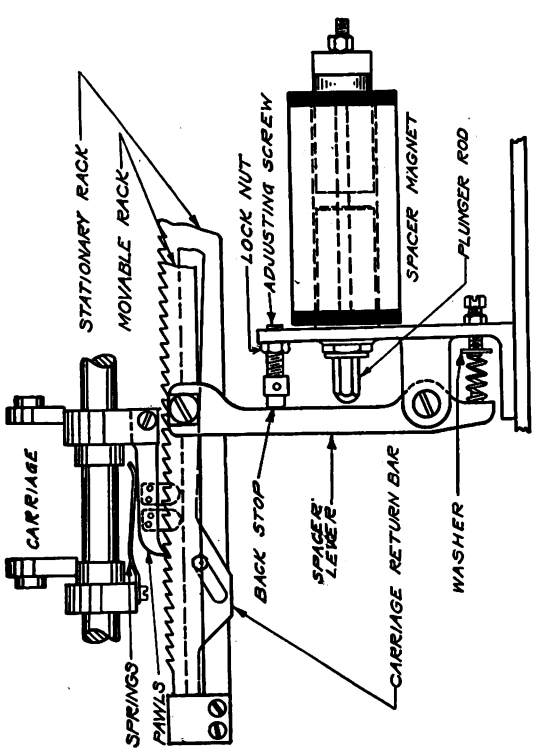


FIGURE 31. SPACER MECHANISM.

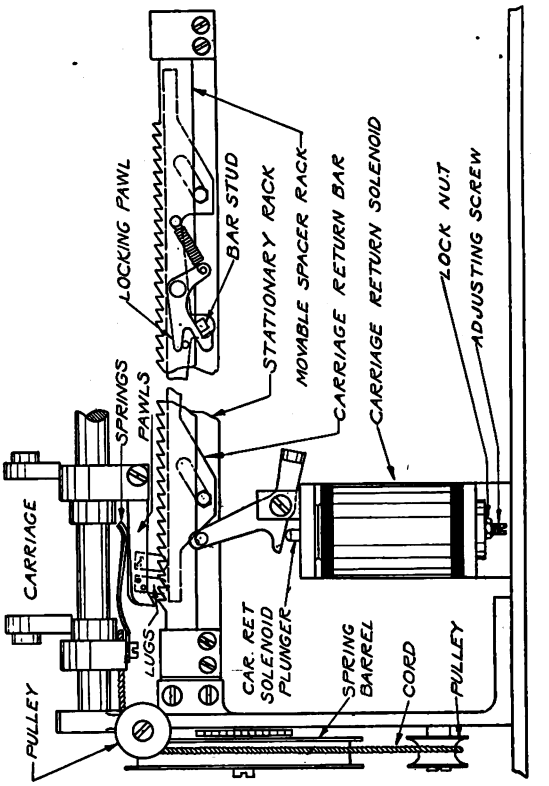
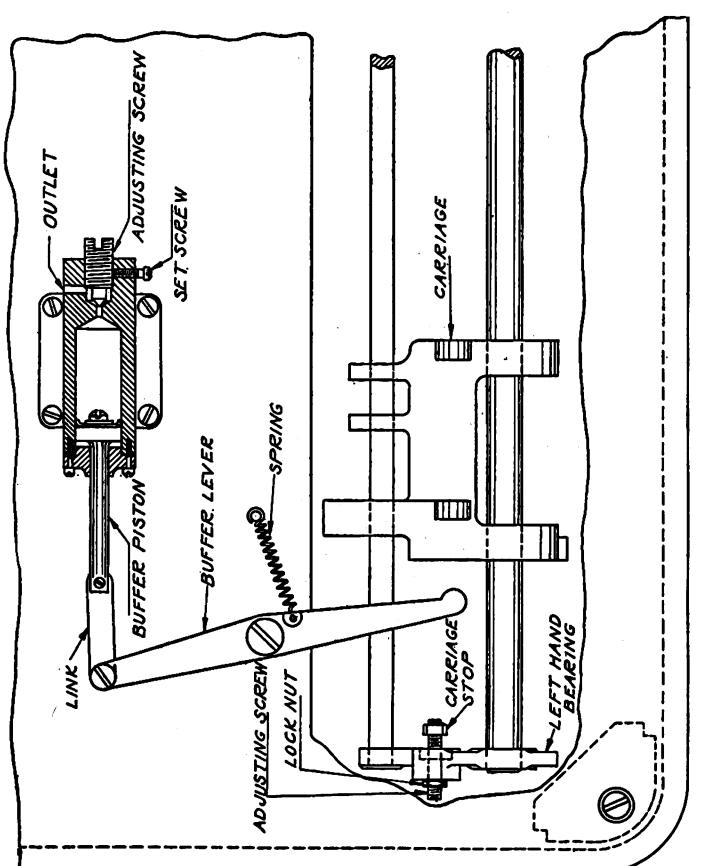


FIGURE 32. CARRIAGE RETURN MECHANISM.



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far, the centering pawl will slip over the extension of the cam and slide on the smooth surface and have no effect on the index arm until it again approaches its vertical position.

The index arm is locked in its vertical position by means of the locking cam and the locking pawls. The locking cam is fitted on the gear shaft at the inner side of the right end bearing. The locking pawls are pivoted below the gear shaft and held by a spring in such a manner that if the gear shaft tends to rotate, the lugs of the locking cam striking the vertical extensions of the locking pawls will prevent the rotation.

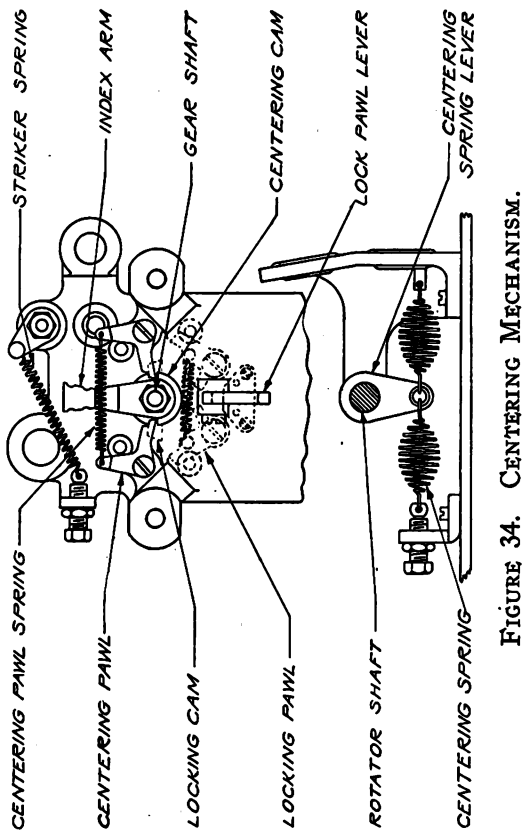

FIGURE 34. CENTERING MECHANISM.

These locking pawls must be thrown out of engagement with the locking cam before the typewheel can be rotated to print any letter. Referring to Figure 25 it will be seen that a ram is attached to the lower part of the left hand drum plate. When the drum is operated, this ram strikes locking pawl lever, one end of which projects through the left end bearing. As the ram presses against the right end of this lever, its left hand end moves upward and striking the locking pawls, moves them into the positions shown in Figure 34. This leaves the gear shaft free to rotate in either direction.

Striker Mechanism.—The shaft which rotates the typewheel is equipped with a universal joint. The part of this shaft above the joint is hollow and passes through two bearings in the striker casting, which is pivoted upon two screws passing through lugs on either side of the carriage casting. Pivoted on a shoulder screw at the front of the striker casting is a link, the lower end of which is attached to the upper end of a lever having a square hole in the lower end. Passing through this square hole is a square shaft, known as the striker shaft. If this striker be rotated in a clockwise direction, the motion transmitted through the lever and the link will rotate the striker casting on the pivot screws, and throw the typewheel against the platen, printing a letter.

Centering Wheel.—The notched typewheel centering wheel (shown in Figure 35) is rigidly attached to the top of the hollow typewheel shaft and has a notch corresponding to each letter. The centering lever is pivoted on point S and has projecting from its side near the lower end, a pin which travels in a cam slot cut in an upright piece fastened to the carriage. The forward movement of the striker causes the centering lever to enter a notch in the centering wheel and thus center up the letter being printed.

Striker Solenoid Mechanism.—Located below the striker shaft at the extreme left end of the printer is the striker solenoid. When this solenoid is energized, its plunger is pulled downward. Horizontal lever A, pivoted by a shoulder screw B at its left end, is attached near its center to the striker solenoid plunger. To the right end of this horizontal lever is pivoted the adjustable striker link. The upper end of this link is attached to a lever C fastened firmly to the striker shaft. Thus, when the striker solenoid is energized and its plunger pulled

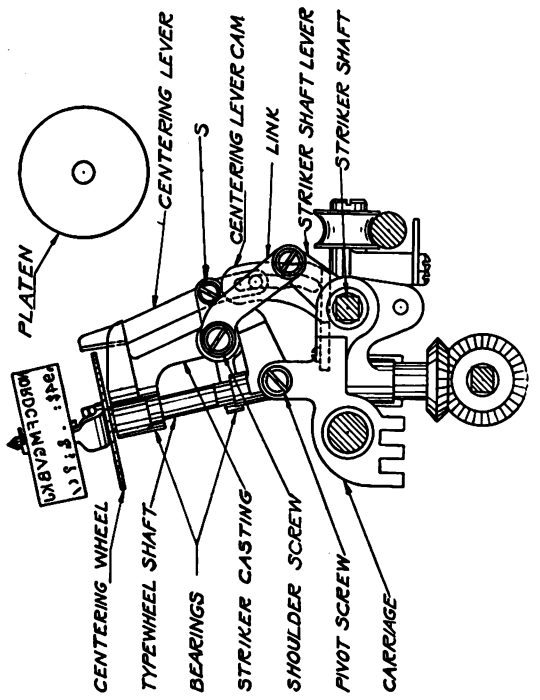

FIGURE 35. STRIKER MECHANISM.

downward, the motion transmitted through the horizontal lever and link will rotate the striker shaft and cause the typewheel to strike against the platen.

When the striker solenoid operates, the right end of the lever C moving downward strikes the adjusting screw of the mechanical main break armature and opens the main break contacts.

(*To be continued.*)

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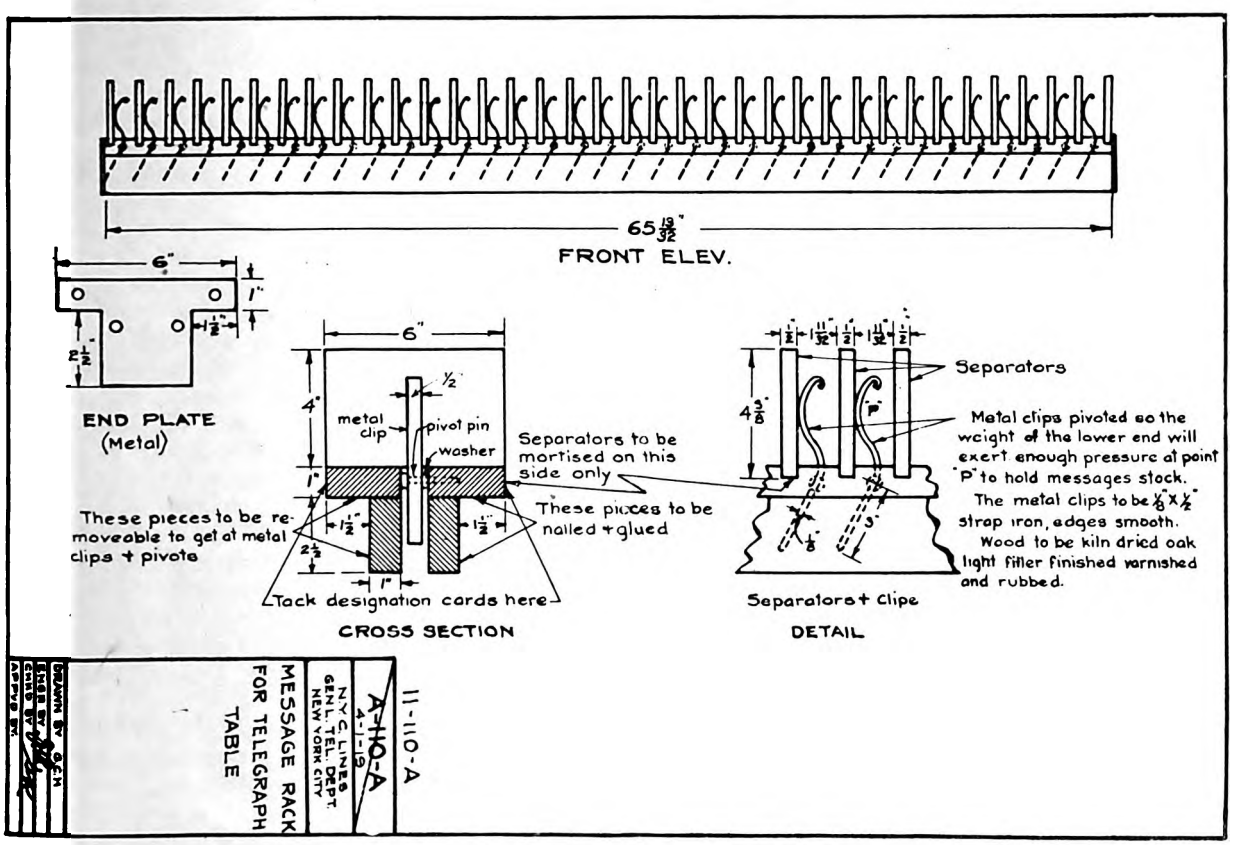
A NOVEL TYPE OF MESSAGE RACK

USED IN RAILROAD TERMINAL TELEGRAPH OFFICES

By Stanley Rhoads.

The New York Central Railroad lines have in use a number of message racks, as shown in the accompanying drawing. These were designed to fill a want which was felt at "PD" telegraph office in the general offices of the C. C. C. & St. L. Railroad at Cincinnati, Ohio. J. G. Gilgrist, now assistant superintendent of telegraph of that railroad, was manager of "PD" office when it was remodeled and equipped with the latest type porcelain panel telegraph switchboard and associated apparatus. He made a suggestion for a rack pat-



Message Rack With Gravity Clip.

terned after ticket cases, which make use of a large marble to hold tickets in place. A sample was made up, using this idea, but it was found that the marble caused pinching action and had to be discarded. A model was then made up practically as shown in the accompanying drawing, and which makes use of an idea suggested by the Western Union message clip stands, 2-B, which have a gravity clip for holding incoming messages. A complete 65" unit was then made up at the Beech Grove shops of the C. C. C. & St. L., and installed on a four-position table which handles the way-wires. It was an immediate success, and other racks were made for various offices and found to be satisfactory where used, particularly on tables having a number of way-wires.

The advantages are that the messages can be reached from both sides of the table; there are no hooks to endanger the operator's hands and eyes; messages on file can be seen at a glance and are undamaged by hooks; pink messages are readily seen; a bunch of messages can be taken out of a compartment and looked over for any urgent business, and placed back without further damage to the messages, which would occur if filed on a hook. The clips hold the messages securely enough so that a strong breeze through an office cannot blow them out of the compartments. If any point on

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the line has a number of officials to whom a large number of messages are sent, it is possible to separate the business, making a compartment for each thus giving a chance to send the more urgent first; as, for instance, messages to the chief operating officials, which ordinarily may need precedence over freight traffic and similar messages.

The racks in use have been made of oak, but it is believed they can be made of metal at reasonable cost, with an asbestos board or other fire-proof pasteboard with metal upright compartment separator. The racks are ordinarily mounted by means of strap iron screwed to the ends of the rack and at a height so that the operator can either look over the top of the rack or under it. When mounted on concentration units it is necessary to mount it above the line of vision of the operator when sitting at the table in order to clear the equipment.

HOW AN EDITOR MAY HELP AN OPERATOR

PLAIN STATEMENTS BY A WIRE VETERAN ON HANDLING COPY AND LIGHTENING BURDENS ALL AROUND

By Mervin S. Allshouse.

Operator in the Associated Press, New York office, on Circuit 3, day New York-Boston wire.

While we operators, of course, yield to an editor's judgment in the matter of news, yet from long experience in working press wires we have a pretty good idea of news ourselves, and there are many ways in which editors can help us, as well as improve the report.

Technically, of course, it is our business, like that of a printer on a newspaper, to follow copy "out the window," yet most of us dislike to transmit something that we know is incorrect. Most of us correct, without notice to the editor, misspelling of common words. But when names are incorrect it is not safe to do this and we have to stop and ask the editor about it. This naturally results in decreasing our operating average and if such errors are frequent in the course of a day the result is likely to be that our superiors in the traffic department will have a poor idea of our efficiency as telegraphers.

Editors should take especial care with proper names and figures in copy and see that they are clear. Frequently the cyclograph fails to reproduce figures and unfamiliar proper names clearly from wax stencils. When such is the case the editors should look them up in the original copy and make them plain for the operators.

We yield to no one in our desire to transmit as quickly as possible hot bulletins that will make newspaper editors say "Gee whiz" and start replating the first page, but it seems to us that some editors are too finicky about breaking a story at once to send bulletins that do not amount to much and perhaps should not be sent as bulletins at all. Some editors do not seem to realize that every time a story is made "more" to send a bulletin it tends to delay the report taken as a whole through the necessity of resetting the date line, with a slug and catch words. Some editors fear to take the responsibility for not moving immediately something that comes to them as a bulletin, even though it was of bulletin importance only to some other circuit. Unless a bulletin is of first importance, an editor should permit the operator to complete the story he is sending or at least finish a sentence. From work in newspaper offices many of us know that newspaper editors prefer to get a story complete rather than in fragmentary form, other things being equal.

Some editors seem to think it is dereliction on their part to have a wire clear. At times items are filed which are, of course, of interest on the circuits on which they originated, but which seem to have no especial value on the circuits we are working. An editor should not file an item for the sole purpose of keeping a wire busy. Even a one-wire circuit can usually transmit plently of copy for the needs of the newspapers on its circuit and it is seldom necessary to send inconsequential items just for the sake of giving the papers copy.

Towards "30" some editors have the habit of trying to cram the wire. We know that as the time for completion of the day's work nears, most papers have gone to press and those which still have pages open can use only the most important matter in brief form. Editors should realize this and so file the wire that highly important matter, if it should happen to come along near "30," can be transmitted quickly. Editors should realize that operators have to keep log sheets, involving more or less arithmetic, and that they must be turned in at the end of the day. Time should be allowed for this when possible. An operator likes to get home early, as well as an editor.

When an editor cuts copy he should do so in such a manner that it is clear to the operator how the editor intends that the story shall read. To cut properly does not require much use of a pencil. Operators know the common and simple markings familiar to every newspaper office. Interlineations and words inserted by the editor should be legible. Sometimes we smile at the amount of work an editor makes for himself when all the editing he does of a piece of copy is to put in paragraph marks. These are unnecessary when the first line of a paragraph is indented, as it invariably is in the copy.

While, of course, we bow to an editor's judgment in the slugging of a story we would like to point out every time a story is slugged it increases the time of transmission.

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THE CLANNISH TELEGRAPHER

Morse Operators Stick Together as a Class Because of a Common Interest in a Unique Profession.

By John Dunsheath.

There is an old saw which declares, "Birds of a feather flock together." I believe it safely may be said that telegraphers the world over, as a class, are more clannish than are the members of any other profession. Captain Kidd and his select crew, or Robin Hood and his industrious companions never were more closely cemented into a social entity than to-day are the scions of Morse.

"Once an operator, always an operator," is a truism which is attested in many ways and on many occasions. There is on record an experience of a railroad president, a former telegrapher, who, while hurrying through a depot to keep an appointment at a directors' meeting, heard a telegraph-sounder ringing with the music produced in it by an expert sender somewhere on the line.

Oblivious of his important engagement, the magnate succumbed to the magic of the wires, and for half an hour listened to the beautifully modulated cadences of the dots and dashes reproduced in the clear, bell-like tones of the sounder. Only when the unsuspecting operator ceased sending did the president of the road come down from the quiring spheres.

Immediately realizing that now he was thirty minutes' late for the meeting, he hurried onward, intently absorbed in formulating an excuse for his tardiness more acceptable than the truth would have been.

There is a recent experience of Thomas A. Edison at the San Francisco Exposition. Mr. Edison journeyed from New York to the Pacific coast to be the honored guest of the exposition authorities.

Many elaborate plans were made for his entertainment, and there was a record crowd in attendance at the exposition on Edison Day. During the afternoon, while debating over a choice of festivities, Mr. Edison learned that two hundred telegraphers were gathered in an auditorium nearby holding a Morse-fest.

EDISON'S HAPPIEST EVENING.

In a moment his mind was made up and he was on his way to get among the knights of the key—his friends of old. Mr. Edison afterwards stated that the evening thus spent was the happiest he had experienced in years.

On another recent occasion the call of the sounder brought together a number of the nation's mightiest men of affairs at the annual dinner in New York of the Ohio Society. The president of the Ohio Society, Mr. Charles P. Bruch—himself a former telegrapher—was aware of the fact that a number of the most prominent members of the society, who are now prosperous captains of industry, were, in their youth, telegraphers; so he had set aside for these men a special table equipped with keys and sounders properly connected.

The innovation was greatly appreciated by the former brass-pounders, and as each one tried out his hand, it was observed that not one of them had any other idea than that he could put it through the repeaters to beat McClintic or Brickhouse.

Incidents such as these constantly recurring, emphasize the fact that the art of telegraphy is one in which its devotees always take pride and never wholly wander away from.

SURROUNDED HIMSELF WITH EX-OPERATORS

Walter P. Phillips, that estimable old-time telegrapher, at one time general manager of the United Press, upon leaving the telegraph business to enter the news-gathering field, recruited his ranks from the pick of men employed in telegraphy. Later, when Mr. Phillips entered mercantile pursuits, he took with him a large number of men who had been expert telegraphers, all of whom, in devotion to the new work, repaid him well for his loyalty and confidence.

Operators have one great advantage over the members of other callings, in that their intercourse is not local or restricted to community groups. Consider the case of an operator employed in Montreal who, on a day in January, arrives at the office in the morning, and, after shaking the snowflakes from his overcoat, removes his fur cap and overshoes, and then sits in at his desk where, for eight or nine hours, he works directly with an operator in New Orleans clad in white-duck trousers and tennis shoes.

Picture, if you can, the unique daily experience of two telegraphers saying, "Good morning," one of them sitting in an office in Halifax while his *vis-a-vis* is situated by an open window in an office in Bermuda.

On wires worked direct between New York and San Francisco, day operators manning wires in 'Frisco at 8 a. m., an hour later hear their New York mates asking for relieving operators so that they may go to lunch, as due to the difference in time between these two points, it is then twelve o'clock in New York.

The universality of working conditions has always made it possible for a competent telegrapher to travel over the country, and in any part of the United States, Canada, or Mexico obtain employment without delay and at good wages. Those operators who have not at least once made the rounds are hard to find.

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There may have been times when the migratory telegrapher has caused managers to consign the whole tribe to the unhappy borders of limbo, but the demand for good men generally has been active enough to make traveling comfortable. Of course, the majority of these men ultimately settle down in a favorite office, and become pillars of integrity in their neighborhood.

It is during the years of roving that life-long friendships are formed—friendships enveloped in all the subtle charm of romance and adventure. Where is the telegrapher who, in a reminiscent mood, cannot unfold many a tale of the cattle country, the plains of the West, or recite daredevil exploits in Memphis and San Antonio?

"VOICES OF THE WIRE."

An operator working nights in a railroad lonely depot in Wyoming or Saskatchewan soon cultivates the uncanny sense of being able to distinguish between the voices of the wire. I never knew an operator who did not carry in memory the recollection of some other man's "sending."

To the uninitiated the ticking sounder babbles but one harsh, unintelligible song, while the trained ear of the expert telegrapher recognizes many different styles of Morse sending. It is a common experience for an operator to remember another man's sending long after the sender's name has faded from memory.

The fact that these things are true explains why telegraphers, in carrying on their share of the world's work, constitute a natural universal brotherhood, whose members have common experiences, common aims, and common hopes.

There are in existence a large number of telegraphers' societies, some having social aims only, some of them historical, others organized for technical study, and a large number of associations widely scattered, providing life insurance and financial aid in case of sickness.

SOME OF THE TELEGRAPHERS' SOCIETIES.

The Old-Time Telegraphers' and Historical Association, organized in the year 1880, has among its members a large number of prominent ex-telegraphers, as well as a majority of the old-timers still engaged in the business. The association holds a convention annually, the attendance always being very large. The qualifications for membership are:

"Any person in good standing, who, prior to twenty-five years before the date of making application, was employed in the telegraph service, and thereafter for five years, shall, upon payment of two dollars (an initiation fee of one dollar and one dollar dues) be eligible for membership."

Another "old-timer" organization is the Society of the United States Military Telegraph Corps, whose members served as telegraphers in the Northern armies during the war between the States. Two of the operators who served in the War Department office in Washington under President Lincoln and Secretary Stanton still are active members of the corps—namely, David Homer Bates, and Albert B. Chandler.

Among the social organizations, the more prominent are the Magnetic Club, New York; the Morse Club, New York, and the Dot and Dash Club, Philadelphia. The Magnetic Club is composed of officials and employees of the Postal Telegraph-Cable Company.

At the spring and fall dinners given by this club each year, more than two hundred members are in attendance. The Morse Club is composed of Western Union Telegraph officials and employees.

On the Pacific coast, the Western Association of Old-Time Telegraphers holds periodical gatherings at Spokane, Washington, Seattle, or Tacoma.

INSURANCE AND AID ORGANIZATIONS, TOO.

Of the national insurance and aid societies, the largest are: The Gold and Stock Life Insurance Association, which has been a successful telegraphers' organization since the year 1876; the Serial Building Loan and Saving Institution, organized in the year 1886; the Telegraph and Telephone Life Insurance Association, (formerly the Telegraphers Mutual Benefit Association), and the New York Telegraphers' Aid Society.

"The Wire Devils."

The above is the title of a new book written by Frank L. Packard, author of several well known popular novels. In "The Wire Devils" Mr. Packard has produced a book based upon the surreptitious use of a railroad company's telegraph wires for criminal purposes. The "gang," composed of ex-telegraphers and ex-linemen, stage many exciting events which keep the railroad company's detective force on the jump day and night for a long period.

The deviltry of the stunts arranged by the ex-operators is palliated somewhat by a romantic and chivalrous streak in the makeup of "The Hawk," who is the chief plotter. The book contains more sudden twists of fortune and exciting moments than any telegraph novel ever before written.

The price is $1.50 per copy, and it may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The Old Wire Chief says: "When I review the occasions in the past when my procrastinating nature caused me to let go by opportunities of embarking upon worthy enterprises which would have yielded noble fruits, my heart is sad. But, when I review those occasions in the past when I have harbored in my heart ignoble designs, while my procrasctinating nature spared me a false step, my heart is glad."

TELEGRAPH SUPERINTENDENTS contribute to the well-being of their subordinates and to the efficiency of their telegraphs and telephones by recommending that all telegraph and telephone employees read TELEGRAPH AND TELEPHONE AGE. It costs this journal a large amount of money to publish the technical information and news items sent out twice each month at a cost to the reader of but two dollars per year.

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RADIO TELEGRAPH AND COMPASS SERVICE ON THE COAST IN THE NEIGHBORHOOD OF NEW YORK HARBOR

EXTENT OF A NEW ART WHICH HAS GROWN UP WITHIN THE PAST FIVE YEARS

In the Third Naval District, which extends from Rhode Island to Barnegat Inlet, there are eight coastal radio stations, which are located as follows: Montauk, L. I.; Fire Island, L. I.; Rockaway Beach, L. I.; Sea Gate, N. Y.; Bush Terminal, N. Y.; Navy Yard, N. Y.; Mantoloking, N. J., and New London, Conn. There are also five radio compass stations located as follows: Montauk Point, L. I.; Fire Island, L. I.; Rockaway Beach, L. I.; Sandy Hook, N. J., and Mantoloking, N. J. These radio and compass stations are all controlled from one central control station, located at N.o 44 Whitehall street, New York city, at which place are also the offices of the district superintendent of the United States Naval Communication Service. Direct wires from each of these stations lead into the central control station, and by means of a plug board arrangement similar in type to that used by the telephone companies any one of these stations may be used as a transmitter by the operator on watch at the control station.

This station is divided into a number of booths which are magnetically shielded from one another and which contain receiving apparatus of the most up-to-date type. Each booth is given a wave-length which the operator on watch must guard. There is no transmitting being done by means of distant control through one of the other stations mentioned above. Therefore, if the operator on watch at five hundred metres receives a call and desires to answer he promptly plugs in on a wire to any station he may decide to use and transmits via that station. He is listening all the time to what he is sending and should he hear a distress signal he could instantly stop and give his attention to the distress call

A chief radio electrician is on duty at this control station as supervisor of traffic. On his desk he has a receiver which enables him to "listen-in" and keep check on the traffic being handled on the various wave lengths, and, from time to time, gives orders to the various operators and stations so as to avoid interference. Such a system of supervision was found necessary in order to overcome some of the difficulties brought about by the large increase in radio traffic about the port of New York.

All of the stations in the Third Naval District, however, are not at all times controlled from the central control station. If traffic warrants it some outlying station, such as Montauk or Fire Island, is given orders by the supervising electrician to handle traffic independently. At such times the outlying stations are practically acting as agents for the control station.

The great advantage besides regulating radio traffic and cutting down the amount of interference is that should any of the stations in the district or the control station hear a distress call or any other emergency arise the control station can immediately notify all stations to stop sending which will leave the air clear so that the emergency may be taken care of. The ability to stop all stations in the district instantly is an absolute necessity in time of war and proved itself of much value during the time the German submarines were active along the American coast.

The radio compass stations are controlled in a similar manner to the radio transmitting stations in the Third Naval District. Each compass station is connected with the Compass Control Station, at No. 44 Whitehall Street, New York city, which is in the same room with the Radio Control Station by means of direct wires. The compass stations are not equipped with transmitters, and, therefore, never work independently of the control station, but forward all their bearings to the supervising operator. The procedure followed by a vessel which desires her position is as follows:

The vessel calls "N.A.H," the call letters of Navy Radio, New York, signing off with the ship's call letters, followed by the international radio abbreviation "QTE," meaning "What is my true bearing?" or with "QTF," meaning "What is my position?" When this signal is heard by the radio operators on watch the compass supervisor is immediately informed and he, by means of a master key which controls all wire circuits to the compass stations simultaneously, notifies the compass stations that the ship is calling for bearings and gives the wave length by which the ship will transmit. The radio operator in the meantime has acknowledged the ship's call and instructed the ship to transmit by sending dashes on whatever wave length he may specify. The compass supervisior, who also "listens-in" to the radio signals, gives a signal on the wires leading to the stations when the ship commences to send dashes, or, in other words, as much as sends "There he is now." All five stations in the district then take bearings on the ship which is transmitting, and, when the supervisor calls for same, forward them to the control station on the wire. The supervising operator enters upon a specially prepared radio blank the bearings ob-

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tained, and before transmitting these bearings to the vessel plots them on a chart especially prepared for this purpose, noting whether a good fixus was obtained. If the bearings obtained were good he turns over the radio blank to one of the radio operators, who, in turn, transmits same to the vessel.

If the bearings obtained are poor, as shown by plotting them on the chart, the compass supervisor informs the radio operators, who request the vessel to repeat in order that a new set of bearings may be obtained.

The average time required to obtain the bearings and forward same to a vessel is between three and four minutes. In thick whether there are many calls for radio bearings, and the five stations in the Third Naval District are kept busy. It is always the desire of the supervising compass operator to obtain bearings from as many stations as possible, in order to note whether they all check. If bearings can be obtained from three or four stations, and these bearings all intersect at one point, he is then reasonably certain that the bearings obtained are accurate.

Electricity Supply Company Uses Wireless Telephone.

The Public Service Company of Northern Illinois is installing wireless telephone equipment at its Blue Island and Joliet stations. The stations are twenty-five miles apart. The radio telephones will have a range of about 100 miles and will be used to safeguard communication in case the wire lines are put out of commission due to weather conditions or high voltage induction disturbances.

Submarine Cable Working.

"Beginner's Manual of Submarine Cable Testing and Working," by G. M. Baines, is a book of 265 pages dealing in a thorough manner with the operation of submarine telegraphs.

The first four chapters contain elementary matter relating to batteries, electrical laws, etc. Chapter V. covers copper resistance of cable, instrumental zero, false zero, theory of false zero test; and in the following eighteen chapters up to date matter is incorporated explaining cable insulation tests, inductive capacity of cables, tests for broken cables, curb transmitter, mouse mill device, recorder adjustment and other matter which should form a part of every cable man's technical knowledge.

The price of the book is $4.50, and copies may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The Old Wire Chief says: "It takes only ordinary hen-sense to know when a setting of eggs is hatched, and it is right to stick close to the setting as long as sticking close serves the desired consummation; but the closer one sticks the sooner comes the time when fruition requires him to move on. The thing to make sure of early is that your setting does not consist of china eggs."

SHOP TALK.

BY THE OBSERVER.

HELPING THE JUNIORS.

I believe the day is past—at least I hope it is—when a supervisor neglects to give all necessary explanatory aid to his assistants. Unless a man starting to work in either the traffic or testing and regulating departments is instructed gracefully and effectively when he first starts in, he will have a hard row to hoe, unless he has had a considerable amount of previous experience at another station.

I believe the chart of the wires should be loaned to all aspirants for traffic supervising positions, as well as testing and regulating positions. If this is done they are enabled to become familiar with the routes much quicker than by having to figure these things out for themselves.

They are enabled to figure out some "cross-lot" way of reaching various terminal or way offices, and to understand notices of wire trouble sent out by wire chiefs.

In mentioning wire charts as pertaining to the needs of the traffic supervisory aspirant, only those wires he is likely to be interested in should be drawn as the initial exhibit, and a pencil sketch is sufficient. After that an occasional review of the State map will round out his knowledge.

In the testing and regulating department many students attempt to accomplish too much in too short a time, the result is the often referred to process of "cramming." This makes for confusion when the man actually takes hold.

If the testing and regulating aspirant is being trained for a small office, then the particular needs of that station should be demonstrated and clearly explained to him.

Do not pass along too much advanced information, such as formulas, etc., until the student has first learned the routine operating duties. Keep in mind the experience of the youth who aspired to become a musician. The lad sought out a professor and at the first interview the professor in stagy fashion adjusted his violin in position and began a rendition of a symphony in "E." The result was that the youth at the start despaired of ever getting anywhere with music and took up another line of work where he could start in gradually.

The only accomplishment a man can become proficient at without starting at the bottom is that of being able to swim.

Have your students learn one thing at a time—and give them the easy things first.

Cable Codes.

TELEGRAPH AND TELEPHONE AGE is headquarters for all cable cipher codes. Telegraph managers would do well to bear this fact in mind when customers make inquiries regarding such codes. We are prepared to furnish full information on the subject, our knowledge being based on over thirty-five years' experience in handling the hundreds of codes on the market. Address TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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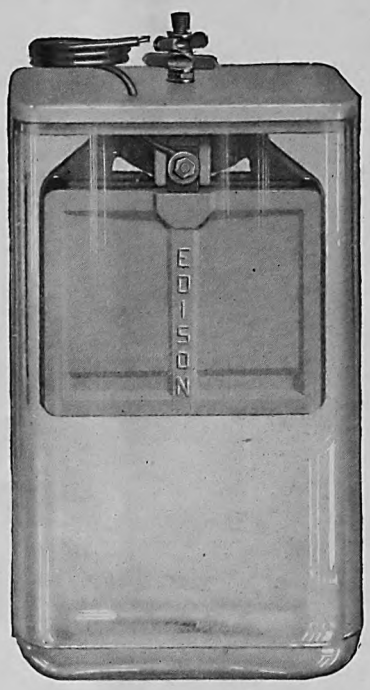
FOR CLEAR TRANSMISSION



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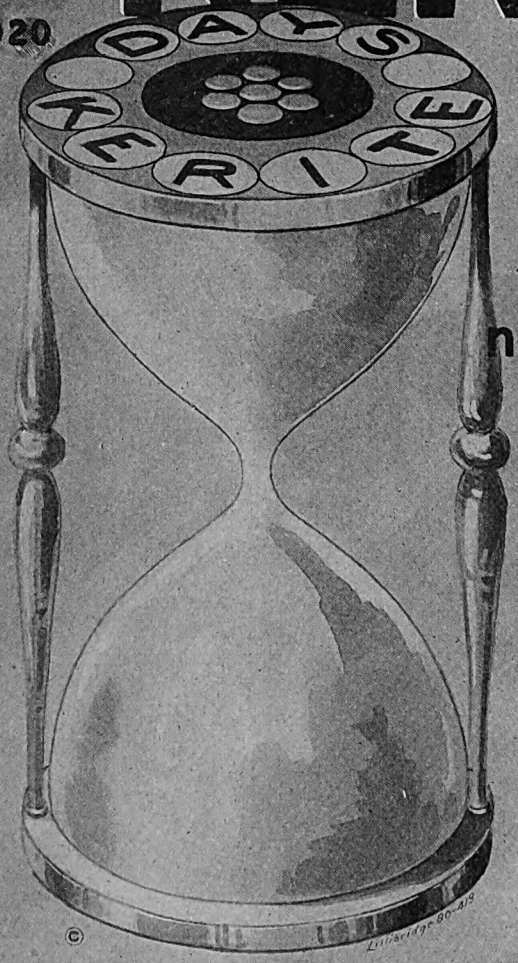

1850

Judge insulating value not by price per foot, but by cost per annum

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THE RAILROAD
TELEGRAPH AND TELEPHONE

COMMITTEE No. 4. "Protection Against Lightning or Electric Light and Power Circuits" Telegraph and Telephone Division, American Railroad Association, held a meeting in New York on December 17. The committee consists of I. C. Forshee, chairman; and Messrs. L. Behner, W. L. Cook, H. W. Drake, W. M. Gould, Stanley Rhoads, H. A. Shepard, G. H. Mayer and P. Norton.

MARTIN H. CLAPP, manager of the Telegraph Section, United States Railroad Administration, Washington, D. C., was in New York on December 17. Mr. Clapp intends moving to New York at the end of December to take up his new position with the Western Union Telegraph Company, as announced in TELEGRAPH AND TELEPHONE AGE of December 1.

H. HULATT, manager of telegraphs, Grand Trunk and Grand Trunk Pacific Railroads, was in New York on December 19 and 20, for a short visit with Mrs. Hulatt who has for some time past been in a New York hospital undergoing treatment.

SAMUEL W. BEACH, a member of the staff, Telegraph Section, United States Railroad Administration, Washington, was a New York business visitor on December 17.

UNITED STATES RAILROAD ADMINISTRATION Federal managers, in the $50,000 per year class, who began their railroad careers as telegraph operators, are: A. J. Earling, Marvin Hughitt, E. F. Kearney and T. M. Schumacher. L. F. Loree, another of the Federal managers, began as a telegraph lineman.

"REMCO"

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(Controlling Patents)

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Manufactured only by the

RAILWAY ELECTRIC MANUFACTURING CO.

250-252 West Water St. MILWAUKEE, WIS.

BALTIMORE AND OHIO RAILROAD

A STAFF MEETING was held in the office of the superintendent of telegraph on October 31, attended by telegraph foremen and linemen. Matters relating to the economical and efficient operation of the telegraph and telephone plant were discussed. This is the second of a series of staff gatherings planned by Superintendent of Telegraph C. A. Plumly, and it is his intention to arrange for periodical meetings of department employees for the purpose of giving all members of his staff the benefit of cooperation.

A. STEVENS, formerly general foreman, who on September 1 last was appointed general inspector, has completed thirty-five years' service with the company.

THE OFFICE at Connellsville, Pa., has been equipped with motor-generators to replace the primary battery installation heretofore used to supply current for the operation of telegraph lines.

CAPTAIN N. M. BAUL, who served in France with the United States Signal Corps, has returned to the service and is employed in "Cs" office, Cleveland, Ohio.

A Real Improvement.

The local battery problem for the operation of telegraph sounders is one that in the course of time confronts every telegraph engineer. The diaphragm telegraph sounder attachment for main line relays, manufactured by the Railways Labor-Saving Device Company of Davenport, Iowa, has recently been improved to a point where it is now a thoroughly practical substitute for the ordinary separate sounder. The device is attached to the contact points of the relay, and with but ten miliamperes in the line, using 150 ohm relays, the sound produced resembles very closely the signals given by an aluminum lever sounder operated by primary battery. Inasmuch as the device requires no local battery to operate it, the saving is apparent.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa.

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QUESTIONS AND ANSWERS

The Old Wire Chief.

J. V. —Glad to know you take kindly to the Old Wire Chief's philosophy. He is somewhat cynical in his remarks, at times; but if he does not become too sarcastic we shall not head him off. Very likely you have before now figured out what he intended in the saying you quote. Perhaps a better definition of the word "psychology" than the one you mention, is: "The science that treats of mental phenomena, and their classification and analysis." At any rate, evidently what he meant by the remark is that he believes his own mentality to be perfectly normal; so, whenever he notes that anyone with whom he may be conversing is engaged in appraising the degree of his intelligence he resents this. He rejects the thought that it is not plain to everyone that his mentality is normal.

Wave-Length of Aerial.

W. G. F.—The wave length of an aerial, whether it is composed of one wire or several wires, depends upon the inductance and capacity of the conductors. The height above the ground at which the aerial is mounted, and the position the aerial has relatively to the earth—that is, whether it is horizontal, vertical or at any other angle—affects the inductance and capacity values.

If the inductance is measured in centimeters and the capacity in microfarads the formula for wave-length in meters is:

$$\text{Wave length} = 59.6 \sqrt{C L}$$

The wave-length of a single wire aerial 225 feet in length at a height above ground (horizontal) of 20 feet is approximately 350 meters.

The term wave-length does not signify the distance electromagnetic waves travel, but refers to the length of the waves being transmitted. A 5,000 meter wave, as you state, is about three miles long; but this wave will travel thousands of miles from its source.

Telegraph Problems.

W. A. L.—Answering your questions in the order submitted:

1. When conductor-wires in cables are insulated with rubber there is considerably less likelihood of individual conductors becoming crossed within the cable, and greater terminal voltages may be applied to the conductors than when paper is used as the insulation. The use of paper-insulated cables is becoming quite extensive in telephone work, where only low voltages are used.

In telegraph work office-cables consisting of enameled, silk, or cotton-covered conductors have been used extensively; but quite recently it has been found that where quadruplexed conductors pass through these cables, breakdown is frequent, especially at cable-heads. This has resulted in reverting to the use of rubber-covered cables for inside conductors carrying quad voltages.

For short lengths of cable, the higher electrostatic capacity of rubber-covered conductors is not serious. Outdoor, or aerial, cables of long lengths generally are of paper insulation, the entire cable being enclosed in a thick lead sheath.

2. With ordinary telegraph voltages, telegraph circuits operated at high speed work as satisfactorily when composed of 500 miles of number nine copper strung on poles as through ten miles of rubber-covered cable.

3. During wet weather when there is a considerable amount of transverse leakage between wires at cross-arms, raising the terminal voltage of the individual circuits improves the working of the circuits; but where difficulties of this nature exist, the proper remedy is not to raise the voltage, but to increase the insulation resistance of the individual conductors at the points of support. Replacing cracked and broken insulators generally has the right effect.

4. The use of the phantoplex system of telegraphy is objectionable only where there are telephone circuits carried on the same pole-line as the phantoplex wires. The phantoplex is not extensively employed, probably not more than a dozen circuits being in operation in this country. Undoubtedly there are many places where the system could be applied with satisfactory and economical results.

The voltages used may be 110 or 130, alternating current at from 60 to 130 cycles. About 300 miles is the maximum length of circuit over which satisfactory service has been maintained.

5. The single-dynamo quadruplex is used chiefly at stations where but one quad set is operated. A quadruplex circuit may have a two-dynamo source of current at one end and a single-dynamo source of current at the other end.

A large office with ten or twenty quad sets may have all of these sets operated by one pair of motor-generators. There are many difficulties in the way of operating more than one quad set from a single-dynamo source of current.

6. As you point out, it is customary to employ the

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increment of current in a quadruplex system to close the neutral-side relay, and the decrement of current to cause the relay to open. The strength of the current required to close the second-side relay, and the value of the current when the armature of this relay releases is determined by the ratio of the long-end and short-end voltage employed.

In the case of a three-to-one ratio the increment may have a value of 75 milliamperes, and the decrement a value of twenty-five milliamperes. Theoretically it is better to use the increased voltage to "make" the signal and the reduced voltage to make the "space" element of the letters.

7. The short-line duplex with battery at one end is a more satisfactory arrangement than the earlier city-line duplex. The former employs standard polar relays, while the latter requires in operation at the non-battery end of the line a special differentially wound relay with a higher resistance in one coil than in the other.

8. Yes, the ordinary bridge duplex will work if a 5U coil is inserted at the split in place of the 3,000-ohm non-inductive coils formerly connected there. For high-speed Wheatstone operation it is likely that the non-inductive resistance would be preferable.

The polar relay in the Western Union quad could not be replaced by a common relay with satisfactory results, as this relay must respond to current reversals at the distant station.

9. As suggested in (5), it is not practicable to use the single-dynamo plan in operating a number of quadruplex sets. The voltage would fluctuate widely, due to the simultaneous operation of several pole-changers.

10. The Jones quadruplex system is regarded by some engineers as superior to any other system in use, especially on lines affected by inductive disturbances, and on lines where high insulation standards are not maintained.

11. A sixteen candle-power carbon lamp requires a current of about one-half ampere. To light ten of these lamps would require five amperes. Twenty 25-watt tungsten lamps require about the same current as ten 16-c.p. carbon lamps at 110 volts pressure.

In charging storage-cells it is well to employ an ammeter to determine the value of the charging current. Charging mains must not be directly connected to a bank of storage-cells. Were this done the mains would be short-circuited. Lamps are employed to furnish the required series resistance.

12. In order to obtain an e.m.f. of 385 volts by connecting together a 200-volt and a 185-volt generator, all that is necessary is to connect the brush terminals of one machine with the brush terminals of the other, making sure to connect the positive brush of one to the negative brush of the other. Across the field-winding of the 185-volt machine the differene of potential would be 385 volts.

13. The cores of telegraph instruments generally are made of solid iron rod, thoroughly annealed (softened). This form of construction is cheaper, and generally more satisfactory, than using a bundle of small iron wires to form the core.

For ordinary telegraph speeds solid-iron cores are "fast" enough for the purpose aimed at. Theoretically, cores made of small iron wires are "faster"; that is, they magnetize and demagnetize more rapidly than solid cores. This principle is taken advantage of in the design of the Western Union neutral relay.

Permanent magnets are used only as you state. In practise, a solenoid is regarded as a coil of wire wound upon a spool with a hollow core, or with a core of non-magnetic material.

It is ancient practise to regard the "resistance" of a telegraph instrument as having accurate bearing upon the instrument's efficiency. For circuit-resistance purposes it is well to know the ohmic resistance of the various instruments inserted in the circuit, but so far as the instrument's efficiency is concerned, it is of greater importance to know the ampere-turns of its winding.

BUT IT GETS YOU NOWHERE

"Here, I say, man," observed the asylum attendant, "what are you doing? You'll never cut wood in that fashion. Turn the saw over."

The toothless side was being drawn back and forth with no appreciable results.

The fellow paused and stared at the intruder.

"Did you ever try to saw this way?" he asked.

"Well, no," replied the attendant, "of course I haven't."

"Then hold your noise, man," was the instant answer. "I've tried both ways, and"—impressively—"this is easier!"

The Old Wire Chief says: "How odd it is that ever we can see so clearly delineated the paths that others should follow to achieve honor and fortune, while the path that would lead ourselves to greatness is so hopelessly obscured amid a labyrinth of paths."

S. O. S!

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY.

PRACTICALLY ALL of the executive officers and Eastern Division officials were in New York during the Christmas holidays.

J. C. WILLEVER, vice-president in charge of commercial department in a letter to officials and employees, dated December 24, says:

"To gauge the significance of the year which is now drawing to a close it is but necessary to compare conditions as they were at the end of 1918 and as they are now.

"In 1918 we were still in the backwash of the war. To be sure, we had our hands full enough during the war and for a period after the cessation of hostilities, but in a way we were like one who has dropped the tools of his daily trade to help put out a fire. Many of our normal activities were for the time being in a state of suspended animation.

"Released from the pressure of war conditions, free once more to take an active part in developing the healthy commerce of the country, which is finding its way back into its accustomed channels, our organization has responded to the new opportunity with inspiring verve and zest. The energy with which the work was attacked made it seem as if everyone had been on his toes waiting for the starting gun, and it has been carried forward with an enthusiasm that has spread its inspiration throughout the organization. As a result, if there is one outstanding phenomenon to be noted at the end of this year of grace, it is the degree to which all of us—rank and file, and officials, all together, without distinction or exception—are co-operating for the common good of the company, and the wonderful *esprit de corps* which this co-operation has developed. Never was there a more harmonious organization, never better team work.

"With this great advantage to start with it needs not a prophet nor a son of a prophet to predict what the coming year should have in store for us That it may be a happy and successful one for each and every member of the commercial department, is my earnest wish."

A DELIGHTFUL "GET-TOGETHER" PARTY was held on Chrinstmas eve in the office of General Manager T. W. Carroll. Presents for all the staff were on a beautifully trimmed Christmas tree. Addresses were made by General Manager Carroll and by Vice-President J. C. Willever, who "dropped in" during the ceremonies. Refreshments were served and the afternoon closed with singing and dancing.

THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY, on Decemer 18, filed plans for the extension of the No. 195 Broadway building, over the remainder of the block between Dey and Fulton Streets. The new building will be of the same height as the present building, and the additional cost is said to be approximately five million dollars. The improvement will displace the old *Mail and Express* building and other business houses.

A CONFERENCE was held in Albany, N. Y., on December 3, of office managers from the northern and central sections of eastern New York State. Thirty-five managers were in attendance. At a banquet given in the Ten Eyck Hotel, speeches were delivered dealing with the advancement of the commercial telegraph business. Officials from New York who attended the meeting were: W. A. Sawyer, district commercial superintendent; A. C. Kaufman, general commercial agent, and F. R. Veale and J. Simmons, commercial managers of the Eastern Division. W. H. Van Zandt, manager of the Albany office, had charge of the arrangements for the meeting.

W. T. BUDDS, of the main operating department, Boston, is agent for TELEGRAPH AND TELEPHONE AGE, and takes care of subscriptions, and of orders for books on any electrical subject, vibroplexes, word counters, etc.

New York Western Union.

MRS. M. G. WALKER, secretary to F. B. Travis, city superintendent at Milwaukee, Wis., was a recent visitor in the Walker Street office.

YUKITOMO YAMANE, electrical engineer to the Imperial Department of Communications, Tokio, Japan, paid a visit to the operating department at No. 24 Walker Street on December 17. He was conducted through the various divisions by Wire Chief Tucker.

AN UNFOUNDED RUMOR gained currency at No. 24 Walker Street recently to the effect that T. M.

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Brennan was going to retire. Chief Operator Gute and Assistant Chief Operator Lawrence, hearing the rumor held a hurried consultation with the object of making sure that no decisive step was made. It developed during the conference that T. B. is president of the assistant chief operators' local, A. W. U. E.; president of the Serial Building Loan and Savings Institution; treasurer of the Telegraphers' Aid Society; member of the executive committee, Telegraph and Telephone Life Insurance Association, and chairman of the membership committee of the Wire Club of New York. These responsibilities added to his regular eight-hour shift in the operating room make T. B. a member of the force we can least afford to lose.

THROUGH THE COURTESY of Col. I. D. Hough, traffic engineer, Eastern Division, the Wire Club of New York attended a private exhibition at the New York public library on December 6, of greatly enlarged photographs showing pictures of the war operations taken by the United States Signal Corps in France. The views pictured in a convincing manner the great work done by our Signal Corps men of the American Expeditionary Forces. We have all heard many verbal accounts of what took place in the battle zones, but the pictures shown by Col. Hough gave us a new and more exact idea of the accomplishments of our energetic soldiers.

An Exceptional Opportunity.

Young men who are engaged in the telegraph or telephone business, and who reside in or near New York, have before them now an opportunity for personal improvement which should be taken advantage of; that is, to become identified with the First Battalion Signal Corps, New York Guard.

Hundreds of young men engaged in telegraph work are confined to indoor work during their hours of duty, and the fact that they have little opportunity to relax or to mix with men engaged in other lines of work tends to make them dissatisfied. They get the idea that they are individually a small part of a great machine.

The Signal Corps organization here holds out the only present opportunity to gain positive and material advantages without paying out money.

The armory is at Thirty-fourth Street and Park Avenue, New York, where there is a large hall completely equipped with gymnastic apparatus. Basket ball, fencing and broadsword teams are constantly being formed; also one-half of each session is devoted to horseback riding at a riding academy. Social entertainments are periodically arranged for, in which all members participate.

The rooms are equipped with baths, pool room and a comfortable library well stocked with magazines and books, musical instruments, games, etc.

At the present time more than eighty telegraphers are identified with the Corps, and it is desired by these men that many other telegraph and telephone workers join them.

The instruction work carried on includes laboratory and field work in telephone, telegraph and radio operation, and the rooms are open four nights each week, affording an excellent opportunity for men to develop along clean, healthful lines and among pleasant surroundings.

Western Union Lake Division.

CAMP SHERMAN branch office, Chillicothe, Ohio, was closed on November 26, the wire heretofore connected into that office being extended to division headquarters and a soldier telegrapher detailed to handle the business.

J. D. PRICE, of Vice-President J. C. Willever's office, New York, was a recent fourth district visitor.

MANAGER BADER of Oxford, Ohio, has been better satisfied with life since the Miami football squad victory over the University of Cincinnati team on Thanksgiving day.

FIRST DISTRICT.—The December meeting of the Western Union Fellowship Club was held in the banquet room of the Fort Dearborn Hotel, Chicago, on December 8, and proved to be a highly satisfactory and enjoyable affair. The organization is typical of the enthusiastic morale of Western Union employees in Chicago. Organized less than a year ago to promote efficiency through good fellowship, the club has grown until it now has nearly one hundred members—the limit provided by its constitution. Each column of the entire telegraph organization is represented in the membership. The officers of the initial organization were: E. C. Ziesel, president; E. C. Schlict, A. C. Johnson, W. A. Rosenbaum, J. A. Morrison, vice- presidents; and Henry Kline, secretary-treasurer. During the year 1920 the affairs of the club will be in the hands of A. C. Johnson, president; M. F. Strider, F. B. Ford, J. A. Morrison, and W. A. Posenbaum, as vice-presidents; covers are always provided at the periodical banquets for Western Union men from other cities who may be in Chicago on meeting nights.

CINCINNATI.—Charles Richter, otherwise known as messenger No. 92, who recently took three rungs at a time up the ladder of fame when he had the honor of shaking hands with His Royal Highness, King Albert of Belgium, is giving serious thought these days to the statement that "The paths of glory lead but to—"Well! Charles has concluded that in the wake of glory lie many pitfalls. Prior to his social elevation he had never had even a puncture in a tire, but following that event he has had a series of bicycle disasters that would have discouraged even the original Mercury. Confiding in his friend, George W. Keith, Jr., of this office, Charles advances the theory that perhaps after all, it is to a man's interests to stick to the common people and shun royalty.

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DETROIT, MICH.—Detroit Local No. 89, Association of Western Union Employees, held a Hard-Time Party, on the evening of December 3, at St. Andrew's Hall. On December 2, a meeting was held at which the following nominations for officers for the coming year were made: For president, William Rosenberg and V. J. Gagnon; for vice-president, A. Day and J. Shields; for secretary, F. Jaminet; for treasurer, A. Rockensuess; members of the Grievance Committee: traffic, F. H. Scott; plant, John Conners; commercial, Miss E. Johnson, E. Anderson, E. S. Bowers, H. Griffin and Miss B. Patterson.

MRS. ANNA BRETZ, an employee of the bookkeeping department, suffered painful injuries recently in a street car accident.

DETROIT employees are busily engaged making plans for the judicious disposition of the additional income they will receive when the 20 per cent and 15 per cent bonuses become effective, January 1.

MRS. MILLIE PERSONEN has been appointed manager of "Hk" office, vice Mrs. Mae Miller, transferred to "Wd" branch office.

Chicago Western Union.

THE CHICAGO MAIN OFFICE is perhaps the largest telegraph office in America. A list of the department heads of the operating department at the present time shows the following names: E. T. Jones, chief operator; R. G. Matthews, night chief operator; C. F. Hauth, late night chief operator, and the following assistant chief operators: A. J. Fuller, Morse; C. E. Willoughby, multiplex; A. C. Johnson, clerical; P. J. Kilburg, service bureau; C. H. Shell, jr., check department; W. F. Webber, testing and regulating; Miss Closson, telephone; J. H. Miller, section A; E. F. Lowery, section B; H. A. Meade, section F; D. R. Skinner, section D; E. P. Haas, section E; E. J. Kilmer, section C; L. Konefsky, section I.

A. J. MERENESS, stationed at the east board—in 1883 chief operator of the office—has retired on pension after thirty-five years' service, and has gone to Florida for a holiday. He is succeeded by J. E. Cox, transferred from the quadruplex department.

A. A. LYTLE, formerly chief operator at Omaha, Neb., succeeds Mr. Cox in the quad room.

F. T. BEAL, of section I, is acting as news correspondent in the operating department for TELEGRAPH AND TELEPHONE AGE. Items intended for publication should reach him not later than the sixth and twentieth of each month.

THE VARIOUS DEPARTMENTS of Chicago headquarters, which have been located in several buildings pending completion of the new Western Union building at No. 224 South La Salle Street, have begun to move to the new offices. Already the division plant, traffic and auditing departments have been transferred, and the general manager's department will probably be transferred early in January. The operating department, telephone department, etc., will remain in the present quarters until the new premises are made ready for them.

A CONFERENCE was held in General Manager A. C. Cronkhite's offices on December 17 and 18, of district superintendents, city superintendents, and division commercial heads of the Lake Division. On the evening of December 17 a theatre party was given the conferees, attended by Messrs. Cronkhite, Welch, Wyrick and Sprague.

MISS LUCILLE MCGUAN, cashier of the office at Alton, Ills., in the latter part of December was married to Abraham Isaacs of Gillespie, Ills. Miss McGuan has been in Western Union service during the past six years and was popular with the company's patrons as well as with her official superiors.

MISS IRENE CYR, of the Escanaba, Mich., office and Walter Morton of that city were married during the Christmas holidays.

New Western Union Office at Los Angeles, California.

In order to care for the increasing business due to the rapid development of Southern California, the Western Union Telegraph Company recently found it necessary to enlarge its facilities at Los Angeles, Cal. A new five-story building was erected adjoining the one occupied by the company. The wall between the top floors of the old and new buildings was removed, creating a large, light room and thus providing operating quarters having more than twice as much floor area as the room occupied on the third floor of the original building. The Western Union now occupies the entire older building and the two upper floors of the new one.

The equipment and layout of the office are thoroughly modern and represent the latest practice in the design of main telegraph offices. Everything possible has been done to provide for the rapid and efficient handling of business, and also for the welfare of the employees. In the operating room the messages are carried directly from each operator to the distributing center by means of a belt conveyor system designed by the engineers of the company. A pneumatic tube system carries messages between the distributing center and the other departments in the building, including the commercial office on the ground floor. After sorting and routing, messages are delivered to the various sections of the operating department by means of kick-back carriers.

The operating room on the fifth floor initially provides, in the Morse department, six tables of eighteen positions each. In the multiplex department there are provided seven doubles, one triple and one quad set. A feature of the cut-over was the

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removal of all the multiplex sets, except one double, from the old operating room to the new. At the present time about eight hundred and fifty thousand messages per month are handled through the Los Angeles office, as compared with four hundred and eighty thousand per month four years ago, representing an increase of about seventy per cent. Los Angeles is now the sixteenth largest Western Union office in point of number of messages handled.

Three sections of main line switchboard, one city loop section and a time service board are also located on the fifth floor. In addition there are the repeater department, motor generator and motor blower plants, main power panel, service department and men's locker and rest room.

The telephone room, which is located on the fourth floor, provides for a five-section recording board, one private branch exchange, thirty-two operating positions and eight school positions. A large and well fitted women's rest and locker room is also located on the fourth floor, besides a schoolroom, lecture room, storage room and offices of the division traffic supervisor and district maintenance supervisor.

The bookkeeping department is located on the third floor, while the A. D. T. operating room and district commercial superintendents' office are located on the second floor.

The large and well appointed commercial office is located on the ground floor. A broad entrance, flanked by two plate glass windows, affords ready access into the spacious lobby from South Spring Street, which is one of the principal thoroughfares in Los Angeles. Its traffic and crowds rival those of some of the better known streets of the Eastern cities. The office is finished in standard Western Union style, and its brilliant illumination at night makes it one of the brightest spots in the city.

Messengers' club and dressing rooms are provided in the basement, together with a tailor shop and laundry.

Managers' Meeting at Dayton, Ohio.

A meeting of Western Union managers of offices within a radius of seventy-five miles of Dayton, was held at the Phillips Hotel, Dayton, on December 10. The meeting was in charge of A. A. Montgomery, district commercial superintendent, fourth district, Lake Division. In addition to the visiting managers, and several members of the Dayton staff, the following officials were present at the conference: A. C. Cronkhite, general manager, Chicago; C. J. Eldridge and P. F. Haas, district commercial agents; E. W. Grob, R. E. Scorah and A. L. Buchanan, of Cincinnati; and G. E. Sharp, division plant superintendent, Cleveland.

The Old Wire Chief says: "The world has been robbed of a great many pertinent pronouncements because the same would not have been consistent with former statements from the same source."

RADIO TELEGRAPHY.

Radio Corporation of America Notes.

PRIOR TO THE DEPARTURE for Buenos Aires of Major Charles P. Bruch and Captain Powhatan Page, in the interests of the Pan-American Wireless Telegraph Company, President Edward J. Nally entertained his staff, to the number of twenty-five, at a sumptuous dinner at the Hotel Astor, followed by a theatre party to see "Aphrodite." The occasion was a very enjoyable one, and served as a pleasant send-off for the travelers.

WILLIAM BROWN, of Chicago, has been appointed assistant to the president.

GEORGE S. DE SOUSA, treasurer of the company, recently met with an accident in the subway car line, which will keep him indoors for several weeks. One of his legs was fractured and the other severely cut.

A CHRISTMAS PARTY was given by the company at the head office in the Woolworth Building, New York, for New York employees, on the afternoon of December 24. One hundred and fifty employees were present and all pronounced the occasion a happy inauguration of the holiday season and of the first Christmas of the new radio corporation. At noon business was suspended for the day and the caterer opened the ceremonies. After the refreshments an entertainment program was carried out by professional comedians, followed by dancing, for which an orchestra was provided. All of the company's officials were present and the offices were handsomely decorated for the occasion.

THE EMPLOYEES of the various New York offices and high power stations in New Jersey and Massachusetts, played the role of Santa Claus this year to fifty poor children, who otherwise would have had no Christmas joy. All contributed generously of their time and money, the result being fifty well-filled stockings containing gloves, caps, scarfs, toys, games, dolls, skates, candies and such things that gladden the hearts of boys and girls. The money contributions amounted to over $250.

W. C. HANDLAN AND H. MALARIN have been added to the construction staff of the San Francisco office.

J. E. BROUSSARD has been appointed manager of the Key West, Fla., district.

AN OFFICE has been opened at Norfolk, Va., with L. H. Gilpin in charge.

WATSON SIDNEY has been appointed district manager at Savannah, Ga.; J. S. Sabo at Portland, Ore.; and H. L. Bleakney at San Pedro, Calif.

IT IS REPORTED that as soon as the Peace Treaty is signed the operation of the Stavenger, Norway, long-distance radio station will be taken over by the International Marconi Company.

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POSTAL TELEGRAPH-CABLE COMPANY

J. F. SKIRROW, in charge of the plant department, is on an inspection trip through the south in connection with pressing demands for increased facilities at many points owing to the heavy traffic.

T. P. DOWD, manager, Washington, D. C., was a recent executive office visitor.

M. F. GEIGLE, who has been in charge of the messenger department at New York City for many years, has been promoted to the position of assistant city manager, effective December 15.

D. SHORTELL, formerly assistant manager, Brooklyn, N. Y., succeeds Mr. Geigle as manager of the messenger department.

EDWARD FLANAGAN, manager, Lake Placid N. Y., office, is spending the winter season in New York and is connected with the city manager's office.

CHARLES GOOD, chief clerk, message file department, is bereaved by the death of his daughter Marion, aged 13. Her death occurred on Sunday December 21.

J. O. YOUNG has been appointed manager at Atlanta, Ga. Mr. Young has been in charge of the Jacksonville, Fla., office of the company for several years; prior to that time he was manager at Tampa, Fla.

OWING TO THE GROWTH OF BUSINESS at Milwaukee, Wis., the company has found it necessary to move, and is now fitting up a new office at 419 Broadway, where the entire building will be occupied. The office is being fitted up under the direction of Division Electrical Engineer Simpson, of Chicago.

MANAGERS APPOINTED: E. E. Ramey, Middletown, Ohio; G. C. Laughlin, Niles, Ohio; V. Plaine, East Palestine, Ohio; B. S. McClane, Decatur, Ills.; E. B. Powers, York, Pa.; A. M. Wood, Columbia, Tenn.; N. A. Russell, Ocala, Fla.; Earl G. Hamel, Greenville, Miss.; E. Johnson, Charleston, S. C.; D. E. Hill, Sterling, Colo.; J. R. Mc Cleary, Princeton, N. J.; F. C. Batson, Milledgeville, Ga.; W. H. Romedy, Jacksonville, Fla.; R. A. Phillips, Rawlins, Wyo.; W. A. Larey, Boca Grande, Fla.; N. Caldwell, Colorado Springs, Colo.; C. A. Brown, Whitehall, N. Y.; A. T. Ash, St. Clair, Mich.; D. R. Sandfod, Quitman, Ga., and L. P. Hale, Palatka, Fla.

New York Operating Department

C. P. WEST, late all night overland chief, has been transferred to the day force as eastern wire chief, and is keeping the trouble-hunters busy.

A. SILLMAN, assistant city chief, who has been absent some time on account of illness, is now recuperating at Livingston Manor, N. Y., and expects to be back with us shortly.

San Francisco Postal.

W. A. DECOW, late night chief operator of the Canadian Pacific Railway Company's telegraph office at Vancouver, B. C., is spending his annual vacation in San Francisco and Los Angeles.

J. J. LYNCH, superintendent of construction, has returned from an inspection trip which took him as far east as Denver, Colo.

C. O. WILLETTE, assistant late night chief operator, has been confined to his home during the first week of December on account of illness.

A. PLATH, formerly manager of the Postal branch, San Francisco *Examiner* office, is now with the International News Service at Salt Lake City, Utah.

EDWARD MEYERS, who works the first New York circuit, recently distributed cigars to his co-workers. A boy.

R. H. CORNWELL, cashier, left the service on December 15. He enters another line of work at Salt Lake City, Utah.

ONE OF THE MOST SEVERE WINDSTORMS in recent years did much damage to shipping in San Francisco Bay the day before Thanksgiving. In addition to blowing down the cable pole and several others at Oakland Mole, all telegraph, telephone and power wires in this vicinity were considerably damaged.

WOMEN EMPLOYEES in the San Francisco main office gave a shower at the home of Mrs. Rose Shultz, chief operator of the telephone department, on December 3, for Miss T. O'Connor, who soon will be married to W. B. Hunter, manager of "U" branch office.

THE CABLE.

THE EXILES CLUB, an organization of submarine cable station employees now has a membership of 1,180. The members are located at cable stations in all parts of the world.

CABLE STAFF CHANGES: Pacific Cable Board—H. I. C. Raecke, from Melbourne to Sydney; T. C. Grant, Fanning to Suva; R. H. S. Baxendale, Fanning to Bamfield; H. Lanyon and W. Craig, from Suva to Fanning, and Alfred Smith from Auckland to Sydney.

BEGINNING DECEMBER 20, the Italian Administration authorized admitting Spanish and Portuguese in addition to the previously authorized codes—Italian, French, English, German and Japanese—for cablegrams to or through Italy.

THE CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY'S new cable between Buenos Aires and Montevideo, South America, was placed in service on December 26. The new link in the company's

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system of submarine cables was opened by connecting a through circuit between New York and Montevideo; for the first time placing the United States and Uruguay in direct telegraphic communication. Messages were exchanged by Secretary of State Lansing and President Brum, of Uruguay.

THE EASTERN TELEGRAPH COMPANY announce that owing to the accumulation of traffic caused by interruptions of main line cables, they regret that they cannot satisfactorily cope with the increasing number of messages which continue to be handed to them by the public.

The appeal which the company made through the press in the early part of October has not had the desired effect, and the public are, therefore, again urged, in their own interests, to reduce the number and limit the length of their telegrams as much as possible.

The company also ask particularly that telegrams of Christmas and New Year greetings should not be sent.

THE TELEPHONE.

DR. FRANK A. WOLFF, of the Telephone Section. Bureau of Standards, Washington, D. C., was a New York business visitor on December 28.

ARTHUR BESSEY SMITH, consulting engineer, Automatic Electric Company, Chicago, Ill., was in New York on December 28. On that date he delivered an important paper on the subject of automatic telephony before the American Institute of Electrical Engineers.

Pacific Telephone and Telegraph Company Notes.

W. T. TEAGUE, division superintendent of plant, Central Division, has announced the organization of a division transmission department with the object of more efficiently handling the problems of transmission engineering in his division. R. H. Bennett of San Francisco has been appointed division transmission engineer; E. D. Jelley, supervisor of transmission maintenance; C. A. Erath, supervisor of cable testing; C. W. Smith, general transmission assistant, and E. G. Dolder, inductive interference work.

A. L. LITTIG has been appointed district traffic chief at Los Angeles, Cal.

W. H. HALLETT, formerly district plant chief, central district, San Francisco, has assumed the duties of district superintendent of plant, with headquarters at Los Angeles. L. G. Fitzsimmons succeeds Mr. Hallett as district plant chief at San Francisco.

F. R. HERRMANN, formerly district plant chief, Los Angeles, has been appointed district plant chief, suburban district, San Francisco.

J. J. SULLIVAN, formerly district inspector, coast district, has been appointed wire chief at Vallejo. He is succeeded by S. D. Saunders of the Northern Division.

THE TACOMA PLANT DEPARTMENT has an order covering the installation of a switchboard and one hundred stations for the Salvation Army Hotel at Greene Park, Camp Lewis, Wash.

A Courteous Telegraph Messenger.

In a crowded elevated train at Evanston, Ill., sat a Western Union telegraph messenger, reading. He had but one arm, his right one. At the Sheridan Road station a working woman entered the train and stood near where the messenger was seated. The boy folded up his paper and gave the woman his seat. It was observed that he did not leave the train at the next stop, or at the second stop; but continued to the end of the run.

The incident here recorded was communicated to a Chicago daily paper and, upon seeing the item, Miss Jessie Lansing Moller, of General Manager A. C. Cronkhite's office, investigated the case and learned that the name of the courteous messenger is Thaddeus Conley, who in the delivery department is known as Number 456.

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Canadian Telegraphs.

In a broad sense, Canada has only an east and west traffic, both rail and wire. Geographically the country resembles a huge dumb-bell. There are two areas of commercial activity connected by a long, thin strip of territory that yields but a very small proportion of the total traffic.

From the standpoint of gross receipts the long haul traffic, from east to west and west to east, constitutes the attractive part of the business.

On the Canadian Pacific Railway there is a one-thousand-mile gap between Sudbury and Winnipeg, and on the Canadian Northern and government railroad routes between east and west, there are revenue gaps of about the same length.

As recently as twenty-five years ago, the communication link between east and west in Canada consisted of but four wires along the Canadian Pacific Railway. One of these was used for train movement; one for inter-division railroad communication, and the other two carried all the commercial and press traffic there was—and at times these two wires were not crowded.

Since that time Manitoba, Saskatchewan, Alberta and British Columbia have become mighty provinces, in industry gradually gaining on the older eastern provinces, Ontario, Quebec, Nova Scotia and New Brunswick.

That the four western provinces have grown, serves to emphasize the comparative unproductiveness, from a traffic viewpoint, of the still existing thousand-mile connecting link across northern Ontario, between east and west.

East of Winnipeg there are two competing telegraph organizations—the Canadian Pacific Railway Company's system and the Great North Western Telegraph Company's system. West of Winnipeg the Grand Trunk Pacific Railway Company's telegraphs add a third system.

At the present time the subject of telegraphs in Canada is engaging the close consideration of the government and of commercial interests. The telegraph companies are seeking an increase in rates in order to meet constantly growing operating costs. A government commission conducting hearings in all parts of the country has about concluded its deliberations, and it would appear from the figures submitted by the telegraph companies at the hearings, that a substantial advance in rates is imperative.

Another matter that concerns the future of telegraphy in Canada is the proposed government purchase of the Grand Trunk Railway lines. If the outcome is that there are to be two competing telegraph systems—one the Canadian Pacific Railway Telegraph and the other a Great North Western-Grand Trunk combination—two interesting phases of the situation await settlement: whether there is to be competition between two national systems, one of them government owned and the other privately owned; and what basis of reorganization will precede or follow consolidation of Great North Western, Grand Trunk, and Grand Trunk Pacific systems.

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THE MORKRUM PRINTING TELEGRAPH SYSTEM

FULL DESCRIPTION OF OPERATION

Sixth Article.

(Continued from January 1 issue.)

Typewheel Shifting Mechanism.—As before mentioned, the typewheel is attached to a spindle which fits into a hollow portion of the typewheel shaft. This spindle is held in position by means of a collar and a screw. There is a slot in the hollow shaft through which the screw passes and thus by moving the collar up and down, the spindle carrying the typewheel may be raised or lowered.

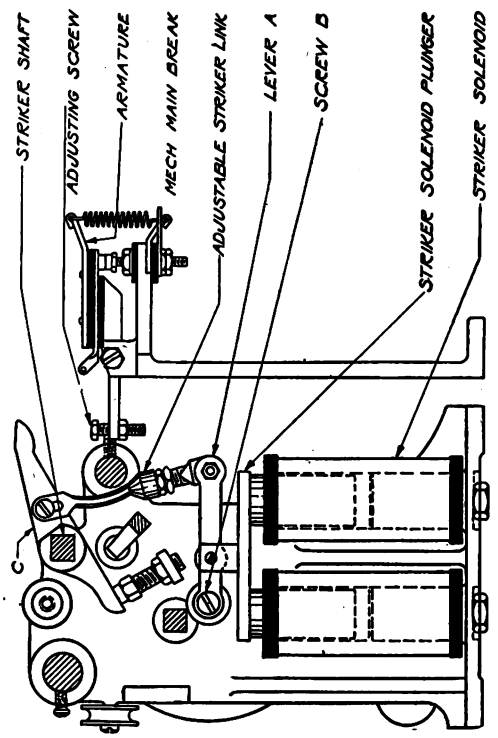
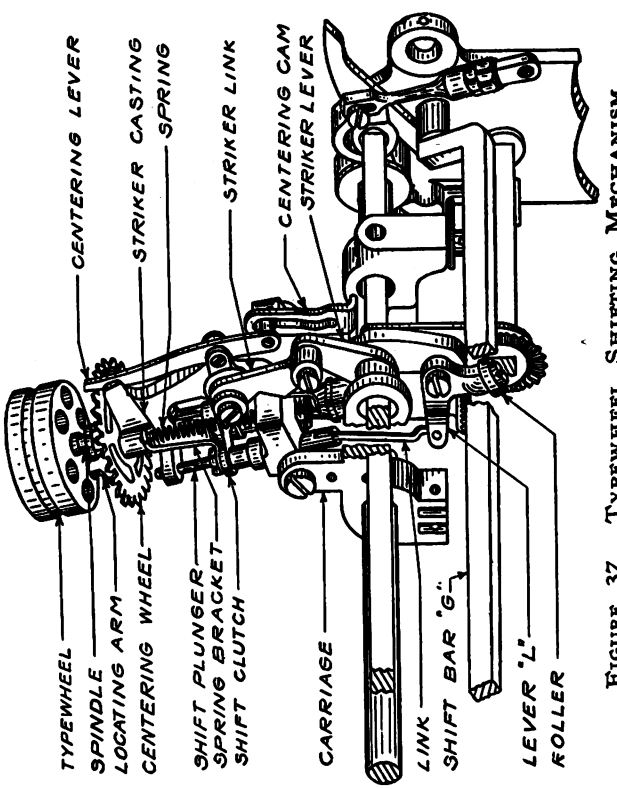


FIGURE 36. STRIKER SOLENOID MECHANISM.

Fitting into a groove in this collar, is a fork-shaped shift clutch. This clutch is fastened, by a nut to the shift plunger which passes through a bearing in the striker casting. The lower end of this plunger is attached, by means of a link, to a pivoted lever L, fastened to the under side of the carriage. On the lower end of this lever is a roller, which bears against a shift bar G (Figure 37), pivoted in the right and left end bearings which carry the shafts.

Figures and Letters Magnet Mechanism.—Near the right hand end of the printer and to the rear are mounted the figures and letters magnets. When the figures magnet operates, its plunger presses against the shift lever in the upper end of which is the shift lever adjusting screw. The position o the adjusting screw is such that when the lever pushed outward by the action of the figures mag net, the screw presses against the shift bar G rotating it. The rotation of the bar G, moves th lever L (Figure 37), whose roller bears against th bar, outward. The other end of this lever is at tached, by means of the link, to the shift plunge which carries the shift clutch fitting in the groov



of the shift collar. Due to the form of the leve L, the outward movement of the roller causes th shift plunger to move upward. This upward move ment is transmitted through the clutch to the col lar and thus to the typewheel spindle, raising th typewheel until the lower row of figures and char acters is in printing position.

The typewheel is held in its shifted position afte the figures magnet has operated. The lever, agains which the figures magnet plunger presses whe the magnet operates, is pivoted approximately i its center. The lower end of the lever rest against a shift latch. A spring, pressing agains

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the lower end, tends to move the projecting end of the latch upward. Thus, when the figures magnet operates, the lower end of the shift lever will pass over the rounded end of the latch. The latch spring will move the latch upward and catch the lever and thus hold the typewheel in shifted position.

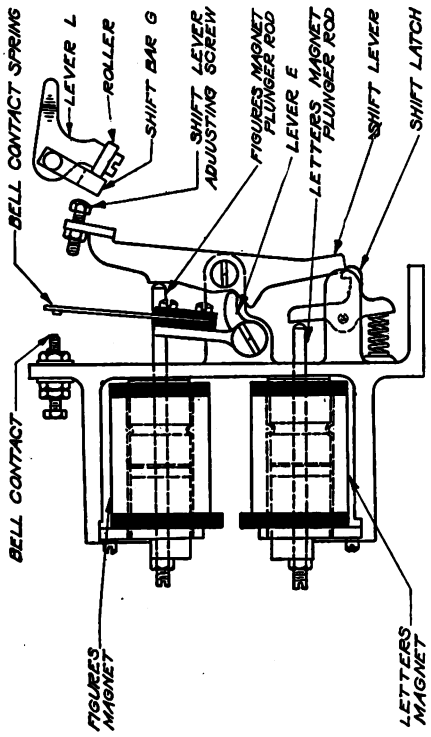

FIGURE 38. FIGURES AND LETTERS MAGNET MECHANISM.

When it is desired to unshift, or release the typewheel from its shifted position, the letters magnet is operated. The plunger of this magnet, when the magnet is operated, presses against the upper end of the shift latch, pushing it outward and disengaging the shift lever. A spring attached to a bracket on the shift plunger (Figure 37) then pulls the typewheel down.

Bell Contacts.—The bell contact spring, fastened to a short lever E, controls a signal bell circuit (Figure 38). This lever E presses against the shift lever, in such a manner that when the lever has been moved to operated position by the figures magnet, the contact spring will press against the bell contact screw, closing the circuit. When the shift lever is restored to its normal "letters" position, the contact spring will be drawn away from the contact and the circuit opened.

Line Feed Mechanism.—The line feed mechanism feeds up the paper when a new line is to be started. Attached to the left hand end of the platen roll is a ratchet wheel. Attached to a short shaft passing through the platen bracket is a line feed lever, near the upper end of which is pivoted a pawl. On the under side of the printer top casting is the line feed solenoid. A plunger rod which is screwed into the magnet yoke, passes through the top casting and when the yoke is pulled upward, through the magnet being energized, the plunger rod presses against a short lever A, on the same shaft to which the line feed lever is attached. This forces the line feed pawl against the ratchet, revolving the latter and feeding up the paper.

A detent is pressed against the teeth of the ratchet by a spring to insure even spacing.

There is a lever to regulate the position of the

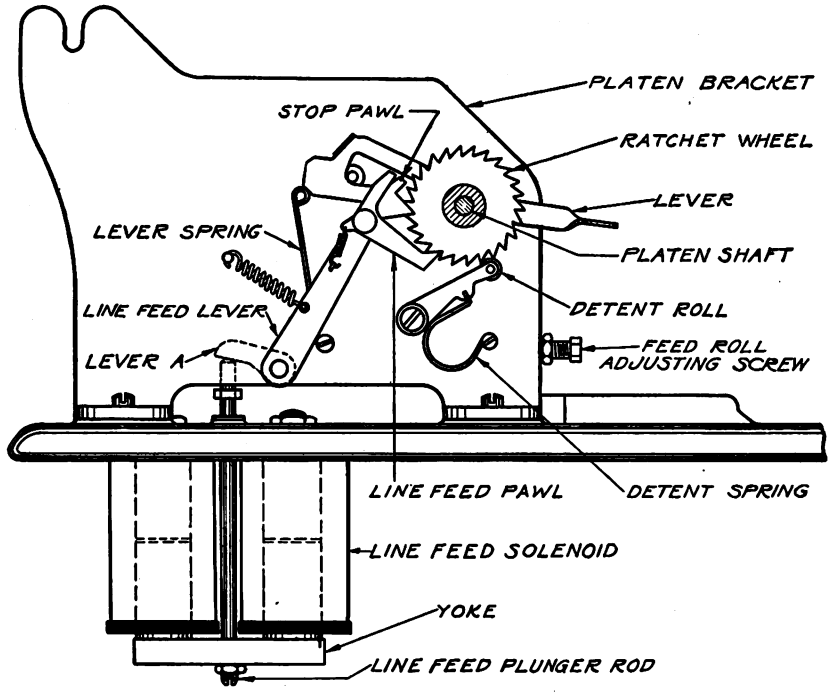

FIGURE 39. LINE FEED MECHANISM.

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line feed pawl, mounted loosely on the platen shaft. When the outer end of this lever is up, it fixes the position of the pawl so that when the magnet operates, the platen will only rotate the distance of one tooth of the ratchet. When the lever is down, the pawl moves the platen ratchet two teeth.

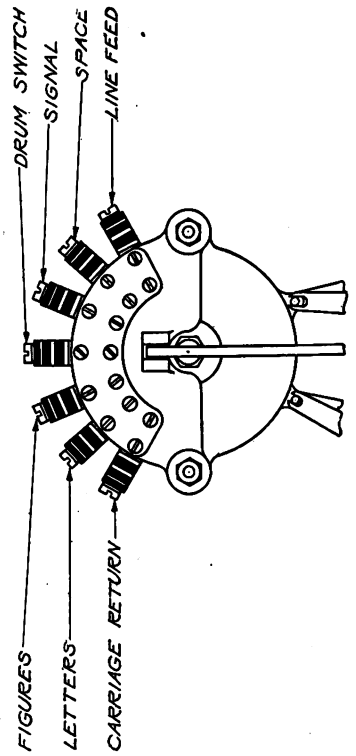

FIGURE 40. FUNCTION CONTACTS.

Function Contacts.—The method by which the electrical circuits are closed to the various magnets which control the several functions of the printer, other than printing, such as line feed, carriage return, space, etc., is as follows:

Pressing against the edge of the left hand plate of the selector drum are seven levers, each controlling a contact. When the drum moves forward, these levers drop onto the edges of the interference plates. (Figure 25.) If the notches in the plates are lined up opposite any lever, that lever will drop into the notches and the corresponding contact will close.

The middle contact lever allows its contact to close on every movement of the drum, regardless of the setting of the plates. This contact is known as the drum switch.

CIRCUITS AND OPERATION.

As stated before, the five selecting magnets govern the operation of the printer. Selecting magnets 1, 2, 3, 4 and 5 set the interference plates which determine which stop pins shall pass through or which function contacts shall close. Selecting magnet 4 controls the operation of the fourth pulse relay, which determines whether the type wheel shall rotate to right or left or which set of function contacts shall receive battery.

After any desired combination of the five selecting magnets has been operated, the sixth pulse relay is operated. This relay energizes the drum magnet and initiates the printing of any letter or the performance of any function such as line feed, carriage return, etc.

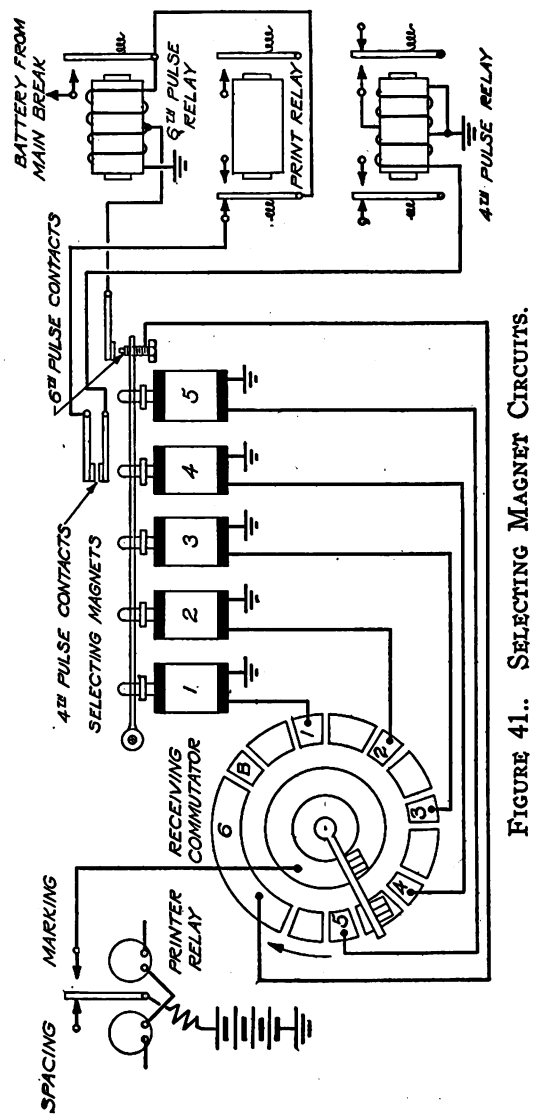

FIGURE 41.. SELECTING MAGNET CIRCUITS.

Selecting Magnet Circuits.—The five selecting magnets are connected directly to five segments of the receiving commutator of the distributor. The receiver brush is connected to the marking contact of the line relay, whose tongue is connected to battery. The line relay is actuated by the impulses sent over the line and when the impulses are marking the tongue of the relay will touch its marking contact and connect battery to the receiver brush. As the brush passes over the segments of the commutator, it connects the selecting magnets of the printer successively to the marking contact of the

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line relay and if, while any selecting magnet is so connected, the line relay tongue is against the marking contact, battery will flow into the selecting magnet and operate it.

Sixth Pulse Relay.—The magnet of the sixth pulse relay is not connected directly to a segment of the commutator, but the circuit to this segment passes through the sixth pulse contacts controlled by the armature of the rest magnet. (See Figure 29.)

When any selecting magnet is operated and its trip rod released, the collar of this trip rod striking against the reset armature, moves the armature and closes the sixth pulse contacts. This completes the circuit from the segment of the commutator to the coil of the sixth pulse relay. When the receiver brush passes over the sixth segment, the line relay tongue is always against the marking contact. Therefore, the sixth pulse relay will be operated, providing any of the selecting magnets have previously operated causing the sixth pulse contacts to close.

(To be continued.)

APPLICATION OF POWER AS A MEANS OF LABOR REDUCTION IN CABLE SUBWAY WORK

By A. C. Pilger.

In these times of abnormal labor conditions it is evident that the conservation of labor is a real necessity.

Now there are, and no doubt always will be, certain phases of underground construction work which can be performed successfully only by the old and tried method of manual labor.

This is particulary true of work located in the highly congested business sections of our larger cities where sub-surface construction is extensive and complicated, and in the small outlying jobs where the extent of the work is so small that it is cheaper to do it with labor than to transport any equipment which might be devised to reduce the labor cost; but it is in connection with more extensive operations so located that an opportunity is afforded for the economical application of powers and mechanical devices, that we have especially endeavored to effect a profitable reduction in labor.

The work on a main line subway job logically divides itself as follows:

1. Excavating.
2. Installation of mason work, including concrete and tile.
3. Backfilling.
4. Removing of surplus earth.

Nothing further will be said in regard to the second phase, namely, the installation of the mason work, because it has for some time been the common practice to use mechanical mixers for the concrete work and aside from this, the work is of such a character that it must be done by hand labor.

EXCAVATING.

The excavating work, however, has offered an opportunity for a substantial reduction in labor. Ordinarily, when performed by hand labor, this work consists of two operations, first the loosening of the earth with a pick axe and, secondly, the shovelling out of the loosened earth.

It is estimated that over 50 per cent. of the labor consumed in excavating a trench is spent upon work with the pick axe, and it has been experience that under favorable conditions over 80 per cent. of this pick axe work has been eliminated by means of an ordinary pavement plow.

It has been practice to pass this plow two or three times through a trench, covering a distance of one or two subway sections, and then shovel out the loosened earth by hand, after which additional earth is again loosened with the plow, and this operation is repeated until a trench of the required depth has been obtained.

The standard pavement plow is, of course, not adapted for deep trench work, as the handles will not permit of plowing in a narrow trench to a depth of over 18 inches. We have, therefore, modified this plow by constructing a special handle of 2-in wrought iron pipe so that it can be used down to the bottom of any ordinary trench.

BACKFILLING.

The work of backfilling consists of two phases, first, throwing the earth into the open trench and, secondly, ramming the earth into place so that no settlement will occur after the work has been completed.

In backfilling it is standard practice to assign one shoveller to two rammers. This proportion, however, will perfectly ram the most obstinate soil and where the soil is of such a character that it can be rammed with less labor, satisfactory results are obtained by assinging four rammers to three shovellers or even one rammer to each shoveller. The work of shovelling the earth into the trench, therefore, represents from 33 per cent to 50 per cent of the labor of backfilling, and the work of ramming from 50 per cent to 66 per cent, according to the conditions of the soil.

To eliminate the shovelling work in backfilling, a scraper was designed and built somewhat on the principle of an ordinary snow plow, so that it can be reversed and operated in either direction. In our first experiments with this scraper it was found practical to use an ordinary field plow and throw a furrow of earth from the spoil bank towards the

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edge of the trench by means of the scraper. It was readily found, however, that there is ample power to draw both the plow and the scraper in tandem at one operation.

Inasmuch as the scraper was designed to operate in either direction, it was necessary that the field plow should also operate in both directions and this requirement is admirably met by the standard side-hill plow having a reversible mould board, that is, a plow which can be made to throw a furrow either to the right or left hand side.

Under favorable conditions it is practicable to fill a trench 30 inches in depth and between 20 inches and 24 inches in width with four passages of this equipment.

The second phase of backfilling, namely, the ramming of the earth, is accomplished by means of a power-driven tamping machine. This machine operates a tamper having a striking face 9 inches by 12 inches in size and weighing approximately 80 pounds. It has a fall of 26 inches, delivers 40 strokes per minute, and the machine advances 9 feet per minute under its own power. When the tamper is not in operation the machine can be moved under its own power at the rate of about 4 miles per hour.

With a fill varying from 24 inches to 30 inches over the subway we have found that three or four passages of this machine will ram the earth as effectively as the standard method of hand tamping.

REMOVING THE SPOIL.

The ordinary method of removing surplus earth consists of shovelling it into dump wagons, in which it is carted to the spoil bank or dump. This is rather an expensive operation because of the high price of dump wagon outfits, as well as the high labor cost. Moreover, in those cases where the dump is located near the job the horses and dump wagon are idle while the wagon is being loaded, which is a large percentage of the time.

We have, therefore, sought to eliminate this idle time as well as the hand labor of loading the wagons by using a standard pressed bowl wheel scraper, equipped with a metal apron to prevent the earth from spilling along the street while it is being drawn to the dump.

While the capacity of this scraper is a little less than one-half that of an ordinary dump wagon, it is loaded by the traction of horses and dumps automatically, so that considerable saving can be effected provided the hauling distance is short.

POWER.

Nothing has as yet been said of the power by means of which the pavement plow and backfilling equipment are operated, and while we have experimented with horses and motor trucks drawing through snatch blocks to reduce the speed of plows and increase the force exerted upon them, we have come to the conclusion that the most satisfactory method is to use the power of a five-ton truck operating a heavy winch equipped with a 5/8 inch steel wire rope.

This has the advantage of furnishing an abundance of power directly, without the use of snatch blocks, and at the same time maintaining a slow and uniform motion of the plow so that it can be guided more accurately by the men operating it and thus perform the work much more effectively. Furthermore, the winch truck can be placed in such a position at the head of the trench that the line of pull will be such as to carry the plows in the proper position without difficulty.

From a safety standpoint it is essential that provision should be made against a serious accident or breakage of the equipment if solid obstructions are encountered by plows while drawn by a high power winch. To meet this requirement a shear-pin shackle may be attached to the end of the wire rope at the point where it is attached to the plow.

COST OF EQUIPMENT.

It is noteworthy that the appliances described represent a compartively small investment. The tamping machine, the most expensive unit, represents approximately $500. The pavement plow is a $40 implement. The side-hill plow can be bought for $35 and the backfill scraper represents an investment of about $75.

Furthermore, these units differ widely from cumbersome equipment as, for example, a power trenching machine, because they can easily be loaded upon motor trucks and speedily transported from job to job, and when it is considered that telephone subway work is scattered over a large territory and that the trench mileage on each job is comparatively small, the convenience of transportation and storage is a very important item.

—*The Telephone Review.*

There Is Money in Real Estate.

Walter C. Reid, president and general manager of the Lincoln Safe Deposit Company of New York, is credited with the following story: "A Western real estate agent bought a piece of land in a boom town and built his office right in the centre of the property. The morning after the office was fixed up he hustled in to get ready for a rush business.

"No sooner was he seated at his desk than he saw a man walking across lots toward the place. Just before the stranger reached the open door the promoter picked up his telephone receiver and began in a loud tone: 'Yes,' he said, 'this is Mr. Jones —why, certainly I will sell that parcel of land for $75,000. It's a rattling good bargain at that—of course, I'll meet you in the morning at the Union Trust Company—surely your certified check for $10,000 will be O K—Good-bye.'

"Then, turning to the visitor waiting in front of his desk, he said cordially: 'Well, Sir, what can I do for you? 'Not much,' replied the stranger casually, 'I'm the telephone man come to connect up that instrument.'"

THE BEST SAYING OF 1919: "We live by mutual consent."

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ENGINEERING DEPARTMENT OF THE WESTERN ELECTRIC COMPANY

By C. E. Scribner.

(Charles E. Scribner, late chief engineer of the company, writes the history of the department. The story reproduced here deals with the organization of the present engineering staff.)

With the election of Mr. Vail to the presidency of the American Telephone and Telegraph Company in 1907 and the complete reorganization of the entire telephone business of the country, a new and stronger relationship was established between the engineering department of the two companies. All of the research, development and design work for the entire Bell System was assigned to the engineering department of the Western Electric Company. The laboratories formerly maintained by the American Telephone and Telegraph Company in Boston were abandoned, and all of the engineering work of the Western Electric Company was concentrated in the laboratories in New York. The new arrangement provided for a distinct division of functions and responsibility between the engineering departments of the American Telephone and Telegraph and Western Electric Companies and the combination, which has worked most harmoniously during the past twelve years, has proved of inestimable benefit in the large developments of the telephone and telegraph art which have taken place during that time.

Charles E. Scribner.

In connection with the enlarged work assigned to the Western Electric Company, Frank B. Jewett was appointed assistant chief engineer of the Western Electric Company in 1912. Mr. Jewett had been previously in charge of the transmission development work for the Bell System with the American Telephone and Telegraph Company for a period of eight years, during which time many important advances had been made in transmission development. Mr. Jewett succeeded me as chief engineer at the time of my retirement from active work in 1916. Under his direction the engineering department of the Company has continued to grow and the research and development organization which now exists has received both national and international recognition for the work which it has accomplished.

Of the present assistant chief engineers, J. L. McQuarrie is the senior. Mr. McQuarrie was first employed by the National Bell Telephone Company of Maine in 1882, and later with the New England Telephone & Telegraph Company. He came into the Western Electric engineering organization in 1894 and was appointed assistant chief engineer in 1904. He took an important part in the early organization and management of the department.

The work of E. B. Craft has been connected continuously with the engineering activities of the company. Mr. Craft entered the employ of the company in 1902 in the development division at Chicago and in a very short time was given charge of this work. He has contributed materialy to the success of this work by his many inventions, and has continuously retained charge of development activities to the present time. He was appointed assistant chief engineer in 1918.

In the earlier arrangement of the work with the American Telephone & Telegraph Company, in 1907, E. H. Colpitts was transferred from that company to become head of the physical laboratory of the Western Electric Company. He later organized a group of scientifically trained men for the research activities of the engineering department, and in 1918 was appointed one of the assistant chief engineers.

W. F. Hendry started with the Western Electric Company in 1900 as factory engineer in New York, where he later became head of the service and maintenance branch in 1906, assistant shop superintendent in 1909, and shop superintendent in 1911. He later became assistant superintendent of the telephone apparatus shop and then technical superintendent at Hawthorne. He was transferred to the engineering department in 1916 and appointed assistant chief engineer in 1918.

E. P. Clifford, with the title of commercial manager, is one of the immediate assistants of the chief engineer. The enormous growth of the engineer-

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Navy since the early part of 1918. In spite of the fact that prior to July, 1917, no commercial types of this apparatus were in existence and some of the fundamental problems had not yet been solved, the resources of the Western Electric organization were sufficient to establish on a commercial basis within this short space of time, practically speaking, an entire new art.

Multiplex telephony on a commercial basis, using apparatus manufactured by the Western Electric Company, was established between Washington and Pittsburg during 1918. By this system the capacity of long telephone lines is increased so that four conversations can be carried over one line in addition to the ordinary telephone conversation provided by the ordinary methods, making a total of five simultaneous telephone conversations. Using the multiplex printing telegraph system mentioned above, as many as forty simultaneous telegraph messages can be sent over the same wire.

The Silver Thaw.

What is known as a "silver thaw" is a most spectacular and beautiful phenomenon of nature, but equally destructive to property. It is caused by moisture falling as rain from an upper stratum of the air and coming in contact with a freezing air current close to the earth, which turns it to ice almost immediately it touches an object. If this condition continues, wires, poles, trees, drain pipes, and everything outdoors soon take on grotesque shapes, growing to astonishing sizes in their transfiguration into a world of ice. The unnatural weight breaks wires, snaps off poles and branches of trees, obstructing traffic in the cities with a tangled mass that takes weeks to clear. The loss in property is enormous, particularly in the wire utilities.—*The Pacific Telephone Magazine.*

The Telegraph in Bolivia.

Six new lines are to be added to the telegraph system of Bolivia. Four of these are now under construction. A radio telegraph station has been installed at Cobija to place the northeastern part of the country in direct communication with the other parts of the Republic and with offices in Brazil.

Norwegian Telegraph Statistics.

A statistical report for 1917-18 has been published by the Norwegian Telegraph Administration. The number of telegrams sent in the year was 6,339,159, of which 1,389,910 were foreign. The number of telephone conversations was 9,639,002, of which 173,858 were with Sweden and Denmark. Corresponding figures for the previous year were 9,061,262 and 177,217. Net receipts for the year were Kr. 18,795,958; working expenses, Kr. 15,182,699; and capital expenditure, Kr. 5,558,949.

Telegraphs and Telephone in Iceland.

The telegraph and telephone system in Iceland at the end of 1918 comprised 1,402 miles of pole line and 4,139 miles of wire. There were 140 stations, 1,877 telephone instruments and twelve telegraph installations. In Reykjavik there were 752 telephone subscribers; in Akureyri, 139; and in Vestmannaeyjar, 79 subscribers.

New Telegraph and Telephone Rates in Bulgaria.

Beginning November 1, 1919, a new schedule of rates for telegraph and telephone service went into effect.

The new rate for telegrams is 20 stotinki (4 cents) per word, with a minimum of 2 leva ($0.386). Double rates are charged if receipt is demanded.

Telephone subscribers are divided into three classes. In the first class are included government offices and private houses; in the second class, mercantile establishments and the offices of physicians, lawyers, editors, printers, etc.; the third class comprises hotels, restaurants, cafes, clubs, theaters, banks, factories, etc. Subscribers of the first class pay 250 leva ($48.25) per year; of the second class, 450 leva ($86.85); and of the third class, 800 leva ($154.40). The cost of installation is additional, and varies from 100 to 500 leva ($19.30 to $96.50).

All conversions above are made at normal exchange, 1 leva equals $0.193. At the time of writing, however, the leva is worth only about 3 cents United States currency.

Operator Interfered With Wires.

J. J. Brown, a telegrapher employed at Arlington, Ore., who, during the telegraphers' strike in the summer of 1919, interfered with the operation of circuits passing through his station, has been sentenced by Federal Judge Bean to six months in the county jail and to pay a fine of $500.00.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

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From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The Old Wire Chief says: "It is likely that on many occasions men have been given much credit for conservatism when in reality their caution was due to apathy."

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INSULATING MATERIALS

PROPERTIES AND USES OF THE MOST WIDELY USED ELECTRIC INSULATORS

Carbon is a conductor of electricity; mica is a non-conductor, or insulator.

From the theoretical viewpoint and with the idea of being accurate, it is perhaps well to keep in mind that a substance which prevents the free flow through it of an electric current—an insulator—might be regarded as having a conductivity very low in comparison with that of substances which are known as electric conductors. A substance should not be regarded as a perfect insulator unless the interposition of a section of it in an electric circuit would entirely stop the flow of any part of the current.

Perfect insulators have not yet been discovered. In practice, however, many different insulating substances are used which have a degree of insulation equal to the requirements of the various electrical services.

Having in view the investigations of Sir J. J. Thomson, some time ago Mr. H. M. Dowset described the atom as consisting of a spherical positive nucleus, surrounded by a moving belt of equally spaced free electrons or negative charges. It is the motion of these free electrons which constitutes an electric current, and conductivity is the property of transferring them from one atom to another.

In a good insulator, therefore, this interchange does not take place.

The atoms of the inactive gases, helium, neon, argon, krypton and xenon, are not supposed to have any free electrons, but all other insulating elements have either (1) a very tight hold of them, or (2) the atoms are well spaced apart so that their mutual action tending to free each other's electrons is weak.

Sulphur is an example of the first class. In its amorphous state, with its atoms fairly close together, it has a resistivity of 4×10^{15} or 2×10^{21} that of copper. This figure is so large that if it were not for its chemical activity, one would be inclined to think that sulphur has no free electrons.

Selenium is similar to sulphur. Measured in the dark, its resistivity is 2×10^{16} or 10^{22} that of copper.

The vapors of the good conducting metals and all gases are examples of the second class. They are all insulators.

If now we consider the effects of atomic groupings on insulation, we have to note that the free electrons in the molecule of a simple element, or in the molecule of a compound, are supposed to be the chemical bonds which hold the atoms together. They are, therefore, less free in this state, and for this reason the molecule is a better insulator than the atom.

Although there are many good insulators, such as mica and quartz, which have a structure; the structureless state, indicating molecular independence, is essentially that which gives best insulation.

When sulphur is changed from the amorphous to the crystalline state its insulation falls. The change is much more marked with silicon. As an amorphous brown powder it is a good insulator, but the steel gray crystals are conductors.

Again, selenium, in the dark, is an insulator, but when exposed to light it receives a structure, and becomes a conductor.

GLASS AS AN INSULATOR

One of the best insulating materials is glass. The whole aim of its manufacture is to insure that it shall be structureless. Glass is composed of a number of substances which are not chemically combined, but are in mutual solution. Ordinary window glass, for instance, consists of sand, limestone, salt cake, and a few auxiliary substances, silica and lime predominating.

Now, in a liquid solution the molecules of the different substances diffuse evenly all through the volume, as in a gas. Each molecule is as well separated from molecules of its own kind as it can possibly be, and there is no structure. Such is the case when glass is molten. The whole effort of the manufacturer is to retain this state when the glass solidifies.

As the temperature of the liquid falls, one constituent tends to solidify before another, as their freezing points are not all the same. This tendency must be checked, otherwise the material becomes crystalline.

The manufacturer, therefore, at a certain stage of cooling chills the solution rapidly, so that the particles of those substances which solidify first have no time to move together through the resistance of the liquid before the whole is solidified.

The congealed solid, therefore, has its molecules in the same relative position as when the material was in the liquid state. It remains a perfect mixture, and it is this discontinuity of similar substance which is principally responsible for its high insulation.

Glass can be made from a large variety of substances. Even the best conducting elements can enter into its composition and contribute to the production of a good insulator, simply due to the way their molecules are arranged in the material.

The different kinds of glass naturally show different degrees of insulation, according to the resistivities of the elements composing them. Those

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containing silica and lime are the best, having a maximum resistivity of 2×10^{14}, while those containing lead or alkali are the worst. What is known as conducting glass is very rich in alkali, and has a resistivity of 10^8, that is 2×10^{14} as much as copper, so that it is still very much an insulator.

Glass may either be cast in moulds, rolled, whirled into discs, or blown into cylinders. The cylinders may, later, be cut, opened out and annealed into flat plates. It is the blowing process, as we should expect, which produces the best insulator, for this method strains the material until the molecules very nearly part company.

Glass, however, expands and contracts with variations in temperature; although, when glass is used for telegraph and telephone line wire insulators, this is not a serious condition. A more serious difficulty is that glass has a hygroscopic surface due to the presence of alkaline matter in its composition which makes it absorb humidity to an extent that decreases somewhat its insulating qualities.

PORCELAIN

The chief substances of which porcelain is composed are feldspar, quartz and kaolin, also called porcelain earth, the latter being the most important. If porcelain earth is burned alone the result is a white, hard, porous substance which is highly hygroscopic and unsuitable as an insulating material. Feldspar, when heated above 1,200 degrees, produces a glass of dull, milky appearance, caused by numerous small air bubbles. If heated still higher it has the capacity of fusing quartz and forming in combination with the same a homogeneous flux. The glaze of porcelain is nothing but a glass flux produced from the burned porcelain mass itself by the addition of other fluxes, as feldspar, chalk or magnesia. The processes that take place in the furnace during the burning of porcelain have been summarized as follows: 1. Porcelain, especially that employed for high-tension insulators, must not be burned below a certain temperature (1,400 to 1,450 degrees Centigrade), because at these temperatures the most important chemical and physical changes take place in the mass. 2. The air bubbles in porcelain are the cause of glow and brush discharges and of those breakdowns that are not due to faulty porcelain in itself.

MARBLE

Marble is very much used in switchboards and switch-panel work. Its insulating properties are good if it is free from metallic veins. Great care should be taken not to spot the slab with oil or grease.

SLATE

Slate is cheaper than marble but it must be enamelled to fill up the surface pores and keep the moisture out. It must be free from metallic veins and its surface must be kept thoroughly clean.

LAVA

Lava is a mineral talc which has come to be important as an insulating material. It is not attacked by acids or alkalies, except by hydrochloric acid, and then only slightly. It neither shrinks nor expands under the influence of moisture, and high temperature has only a small effect on it. In its natural state it can be machined as easily as brass, and after machining it is baked at a very high temperature (2000° F.) which makes it very hard. Its dielectric strength is high and varies with the thickness.

MICA AND MICANITE

Mica is one of the most valuable insulating materials. It is a silicate of aluminum and potassium or sodium. It is found in laminated form and may be split to very thin sheets. It has a very high dielectric strength and can withstand very high temperatures. When it is very gray or black in color in contains iron in excess. Magnesia also tends to darken its color. In its natural state it is not flexible or uniform and permits a large surface leakage. Consequently most mica is reconstructed and put on the market in the form of "micanite."

Micanite is one form of reconstructed mica. The sheets of mica are stuck together with an insulating compound which renders them impervious to humidity (at least for a very long period of time) and enables them to be bent when heated.

Micanite plates are made in varying thickness and in two qualities, one which softens when heated and is easily moulded and one which is intended for commutator segments.

Flexible micanite plates are made in two styles. One style A will retain its flexibility for years, is non-hygroscopic and is used for insulating armature slots and coils, armature and field magnet cores, etc. Style B is a cheaper quality, made from selected pure India sheet mica split very thin.

"Micanite" cloth and paper are made, the former with fine muslin on one side and paper on the other, the latter with paper on both sides. Each is made in three thicknesses with one, two and three layers of mica.

PARAFFINE

This substance is used for high tension apparatus and sometimes for cable terminal insulation. To be of good quality it must be white and not give out any odor. Squeezed between two paper sheets it must not leave any trace on the paper. It must begin to fuse between 104° F. and 122° F.

Its insulating resistance is very high but it completely loses this when subjected to the action of X-rays or radium emanations.

OILS

The dielectric resistance of oil at normal temperature is high and reaches a maximum value when the oils are very pure. This resistance decreases with an increase in temperature till it nears a constant value at the temperature at which the oil begins to decompose. Linseed oil has the least insulating resistance.

The oils which are used in oil switches must have special properties to avoid dangerous accidents.

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Their resistance must be the very highest and they must not contain acids, sulphur or other substances that may combine with the metallic parts of the switches. The oil must not be too heavy or have any tendency to gum, and always be transparent enough to enable the attendant to determine the presence of foreign matter without withdrawing the oil. Their flash and burning points must be high (at least 400° F.) to avoid the danger of fire.

Resin oil is slightly better from the dielectric point of view than mineral oil—but on the other hand its burning point is very low and it absolutely cannot be used for high tension switches.

Humidity decreases the insulating resistance of oils. Oil exposed to a moist atmosphere shows after two days a decrease in dielectric power of about 25 per cent.

The oil used in transformers is very heavy. Its purpose is not to allow humidity to enter into the transformer. It must not contain water or acids and must be heated before using to eliminate the water or air it may contain.

Oils are used not only in their natural state but in the composition of many insulating varnishes.

PAPER

Paper is used very largely in electrical work in the form of common paper and pressed board. To render it imprevious to humidity it is very frequently impregnated with paraffine or other hydrocarbons. Its dielectric power decreases with an increase in the pressure to which it is subjected.

The best insulating value is given by manila paper disposed in well spread sheets. It must be dried in vacuum before using and the impregnating mixture is to be neither too hard nor too fragile. If too hard the paper would break when first bent —if too fragile it would end by completely pulverizing.

Paper covered cables, lead sheathed, are more homogeneous than those covered by rubber and are more easily manufactured. But the dielectric resistance of India rubber is greater than that of paper, making paper covered cables larger and heavier for the same insulating capacity. The paper insulating, moreover, is destroyed with the lead covering and so paper covered cables should not be used where there is any electrolytic effect on the line. Their greatest use is in telephone work.

CELLULOID

This material is made up of a mixture of camphor and gun cotton and is a very good insulator. When manufacturers first began making celluloid it would burn very rapidly when its temperature reached 284° F. By means of a process involving the use of alcohol, ether and a ferric salt it has been rendered incombustible. Before the introduction of this process the manufacture of celluloid was very dangerous on account of the explosive character of the gun cotton. The old time celluloid, itself, was a dangerous thing to handle as it would burst into flame with amost explosive violence. It is used especially in the manufacture of storage batteries and dry battery cells.

RESINS

Different kinds of resins are used in the manufacturing of insulating varnishes for the insulation of spools and wires of electrical apparatus. Their insulating power is quite high, moreover they afford mechanical protection to the inner layers of wires in the spools.

(a) Yellow wax mixed with white wax (in the proportion of 10 to 1) is sometimes used for telegraph and telephone apparatus electromagnet spools. The unwound spools are subjected for five hours to a dry temperature of 212° F. and are then dipped in the mixture which is kept to a temperature of 350° to 375° F. The mixture is left to cool gradually and the spool is withdrawn only when the mixture begins to coagulate. After withdrawing, the spool is heated up again to eliminate the excess of insulating material, and then wound. After winding the spool the immersion process is repeated at least three times.

(b) To increase the inner insulating resistance of electro-magnets and galvanometer spools a red varnish made up of sealing-wax dissolved in alcohol at 194° F. is used. This varnish is spread on the spool cold. To apply a second layer wait till the first one is dry. In practice it is better to apply several thin layers than few thick ones. Sealing wax is also used in the composition of insulating cements for storage battery and similar work.

BITUMINOUS SUBSTANCES

Among the most important bituminous substances are tar, bitumen, and pitch.

(a) Clark's mixture, which is used to insulate underground cables, is made up of 65 parts of mineral pitch, 30 parts of silicon and five parts of tar. This mixture is applied to the cable together with rough hemp in the proportion of one part of hemp to two of the mixture.

(b) The bitumen used in electrical work is largely vulcanized. Used for electrical cables, it contains from five to 20 per cent of sulphur.

For junction boxes and other applications bitumen is mixed with chalk or potter's clay to obtain an economical filling material. Its insulating power is not very high; so it is used for low tension work only.

(c) Dialite is a mixture the basis of which is tar. Cables protected by this insulating material are not subjected to electrolytic effects or to humidity. It does not fuse under overload and can be very easily twisted without cracking. Moreover, its cost is very low.

These substances are used principally in connection with the Edison system of underground conduits. In this the cable is drawn into an iron pipe and the space between the cable and the inner surface of the pipe is filled up with tar. When the iron pipe falls away by getting rusty the tar is the only protection left to the cable.

ASBESTOS

This is a mineral found extensively in Europe, Asia, Africa, America and especially in Canada. In

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its natural state it appears in thread-like fibers and is easily crumbled. Its chemical composition not being very uniform its natural color varies from a silvery white to gray and bluish. What suggested its employment as an insulating material was its notable property of being highly fire-retarding. This would make it a splendid insulator where high temperatures are found. Also, its electrical resistance is high. But the fact that it is very hygroscopic makes possible its use only in very dry places. To avoid this loss of dielectric power by humidity it is generally impregnated with water-proof varnishes. Commercially it is generally found as asbestos powder, cloth, cord or board. If the powder is kept to a temperature of 1272° F. for several hours a kind of porcelain-like compound is obtained.

It is the basic component of a large number of patened insulators, which are obtained by adding to the asbestos different percentages of asphalt and glues and can be said to differ from each other only by the color or fineness.

A very good combination is cement-asbestos, a compound which is subjected to a very high pressure and sold in sheets of different dimensions.

Asbestos and caoutchouc form the so-called vulcanized asbestos which resists the action of water and can stand quite high temperatures. While cement-asbestos can be easily worked while keeping all its good dielectric properties, vulcanized asbestos is very hard and difficult to work, for which reason it is sold already shaped.

YARNS—SILK, WOOL, COTTON, LINEN

For insulating small gage wires four different kinds of yarns or threads are used—silk, wool, cotton and linen. All are valuable for particular purposes, and attempts to find substitutes have been futile.

They are all organic substances; silk and wool are of animal origin, while cotton and linen belong to the vegetable kingdom.

There are two kinds of silk suitable for insulating purposes: Italian tram or "cultivated" silk, and tussah or "wild" silk.

Under the compound microscope the fiber of the cultivated silk appears as a structureless, transparent and nearly cylindrical rod. The average diameter is about .0007 inch. It is the simplest and most perfect of fibers.

This silk is an excellent insulator and is used in the manufacture of the best quality of magnet wire. It is very expensive, costing about nine dollars per pound. Many attempts have been made to load it. Some of the substances that have been detected as adulterants are oil, gums, metallic salts and ground glass.

The tussah silk, which is used as an insulator in switchboard wire manufacture, presents a far different appearance under the microscope. The fibers appear to be composed of bundles of smaller ones. There is also a slight cross structure. The diameter is much larger than that of the tram, measuring about .002 inch.

Tussah silk containing a small percentage of oil, seems to run better on the insulating machine than that containing none. Specifications may allow three per cent.

The spun or organized silk is usually made from the waste of the tram. The tram fibers are spun into ends and these are twisted into threads. It is used for covering telephone and receiver cords.

Wool, as is well known, is the hair of the sheep. It is not used to a great extent, but it is valuable for one purpose—covering cords and cables that are intended for use in damp places. It has an affinity for oil (four per cent allowed) and consequently repels moisture. The fiber proper is cylindrical and covered with minute overlapping scales. It has a characteristic crimp. In diameter it measures about .0024 inch.

Cotton, on account of its attraction for moisture, is of little value as an insulator, but is used to a considerable extent as an outer covering for switchboard wires, cords and cables. The cotton for cords is usually starched to render it smooth and more durable.

The fiber is very characteristic. It is a semi-transparent, flattened and collapsed tube slightly twisted in spiral form. Its diameter ranges from about .0005 to .0015 inch.

The laboratory testing of cotton involves chiefly the determination of moisture and starch. The average sample contains about six per cent of the former, the latter is limited to not over five per cent.

Linen, in exceptional cases, is used as a covering for switchboard cords. It is tough and glossy and makes an excellent covering, but extensive use is prohibitive on account of the cost.

It is spun from the best fibers of the flax plant. Microscopically it appears as transparent, cylindrical tubes regularly built up of cells that show divisions of the fiber.

These divisions or nodes are characteristic of linen and an easy means of detecting it from silk and cotton. Its diameter averages about .0007 inch.

The story of the insulation materials will be continued in the February 1 issue of TELEGRAPH AND TELEPHONE AGE, taking up modern high grade insulating substances and compounds.

Telegraph Employment Conditions in Italy.

The Minister of Posts and Telegraphs in Italy recently refused to grant increases in salaries to telegraph department employees on the ground that the service already represents a deficit amounting to millions of dollars.

The employees then proposed that the telegraph and telephone services be turned over to the workers for management. The leaders of the employees' organization claim that the workers themselves could manage the properties so that salaries could be increased, the deficit suppressed, and a substantial return made to the state annually.

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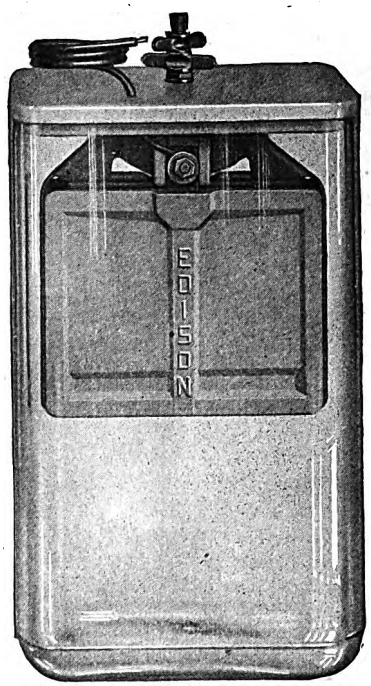
FOR CLEAR TRANSMISSION



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THE RAILROAD TELEGRAPH AND TELEPHONE

American Railroad Association, Telegraph and Telephone Division.

A meeting of the Committee of Direction, which it was intended to hold in Chicago on January 15, has been postponed until a later date. Several of the technical committees which were to meet in Chicago about the same time have postponed their sessions.

FOR THE PERIOD of the remainder of Federal control of the railroad lines, there is a disposition to hold all committee meetings in New York or Chicago in order that the time of travel and the expense incident thereto may be reduced to a minimum.

ROBERT J. PARK, assistant chief operator in the general telegraph office of the Pennsylvania Railroad at Philadelphia, Pa., recently retired on pension after thirty-eight years' continuous service with the company. Upon retiring from the service, Mr. Park was presented by his associates with a handsome gold watch as a token of esteem. J. C. Armstrong, superintendent of telegraph, Pennsylvania Lines East, made the presentation address.

A SYSTEM of wireless telegraph signaling is shortly to be tried by the French State railways. The apparatus, fixed to the ordinary railway signals, comes into operation as soon as the signal is placed in the danger position. If a train passes a signal so set an alarm is immediately sounded in the engine cab. The railroad lines to be equipped include those in the Paris area and the main lines from Havre, Dieppe, Cherbourg, Brest and Bordeaux. It is stated that the total cost of the installations will be about $3,000,000.

W. H. HALL, superintendent of telegraph, Missouri, Kansas and Texas Railroad System, since December 1 last has been serving as regional director's representative on the committee in session at Washington negotiating with the telegraphers' committee. The committee is engaged in considering readjustments of salaries and working conditions.

J. H. MCGLOGAN, who during the past two years has been a major in the Russian Railway Service Corps, operating in Eastern Russia, has returned to this country and resumed his position as assistant superintendent of telegraph of the Great Northern Railroad, with headquarters at St. Paul, Minn.

IMPROVEMENTS have been completed at Cumberland, Md., which permit of the removal of the pole line between the Western Union Telegraph Company's office in the Queen City Building and the right of way of the Baltimore and Ohio Railroad. An underground cable system was installed at a cost of $50,000. Also a motor-generator installation has been placed in service which will furnish current for Western Union lines and for the lines of the railroad company. The work was done by B. F. Thompson, telephone engineer; C. E. Tansill, telephone supervisor, and D. S. Holton, telephone foreman of the Baltimore and Ohio Railroad telegraph department.

E. R. MORGAN, of the Western Electric Company's Boston house, has been placed in charge of the company's New England business covering steam railroads.

WILLIAM LANCASTER, of the Western Electric Company's Richmond, Va., house, has been placed in charge of the company's steam railroad business in the territory which includes Virginia and North Carolina.

R. D. EVES has been placed in charge of the Western Electric Company's steam railroad business in the territory including Kentucky, Tennessee, Southern Indiana, Southern Ohio and the western part of West Virginia. His headquarters are at Cincinnati, Ohio.

B. A. OGDEN, who has had many years experience as telephone manager, wire chief, solicitor, city foreman, and construction foreman, is now in charge of sales work for the Kellogg Switchboard and Supply Company of Chicago.

IN the year 1885, Francois Van Rysselberghe, of Belgium, came to the United States to introduce his system of telegraphing and telephoning over a common electrical circuit.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa.

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MULTIPLEX TELEPHONE TESTS ON THE NEW YORK CENTRAL RAILROAD.

On January 6, some interesting tests were made on wire lines along the New York Central Railroad, in which inventions of Major General G. O. Squier were used.

The test was made over a pair of wires extending between Elmsford, N. Y., on the Putnam Division, and Millerton, N. Y., on the Harlem Division of the railroad, the distance being seventy-eight miles.

The pair of wires being used were at the same time in composite service; that is, each wire was in service as a Morse telegraph circuit,, and long distance telephone service was carried on with the two wires forming the sides of the telephone circuit.

The high frequency circuit operating at 600,000 cycles was superimposed upon the composite system and an excellent additional talking circuit was obtained between the offices equipped with the Squier apparatus.

The tests were conducted by Lieut. R. D. Duncan, and resulted in a considerable amount of pratical data being collected which, when analyzed, suggested several modifications which will be studied and applied in subsequent tests to be made in the near future.

In tests which Lieut. Duncan carried on during the summer of 1919, on a Postal Telegraph-Cable Company circuit between Washington, D. C., and Dixon's Park, Curtis Bay, Md., a distance of approximately sixty miles, the results obtained were very promising.

Satisfactory two-way communication was obtained; speech was received at both stations, loud and with exceptional clearness, the distortion common and inherent to long distance wire telephony being completely absent. The tuning at the receiving stations was quite definite, comparable in every respect to that when receiving signals of a "sharply" tuned radio station. This last fact permits of the operation of a number of multiplex units, each tuned to a different frequency and without the use of filter circuits on the same wire line. The carrier frequency employed in these tests was 600,000 cycles per second (wave length 500 metres); the effective line current, measured at each of the transmitting stations, averaged 60 milliamperes. Throughout the test the operation of the multiplex apparatus in no way interfered with that of the wire telegraph apparatus nor was interference experienced from the latter.

The apparatus used in these tests is known as the SCR-67, which is the ground set of the standard ground-airplane radiotelephone equipment. It comprises two three-electrode vacuum tubes, of the transmitting type (Type VT-2), one oscillator and one modulator, and connected circuit, a receiving tube (Type VT-1) and circuit, and a two-stage audio frequency amplifier. The method of modulation, that devised by Heising, is based on the fact that, to a very close approximation, the amplitude of the high frequency current is directly proportional to that of the E.M.F. applied between the plate and the common filament terminal of the oscillating tube; any variation of the E.M.F., for example, at an audio frequency, will modulate or mold the continuous flow of high frequency energy in a corresponding manner, which when received by a tuned receiving circuit and rectified, manifests itself as an audible sound in a telephone receiver. The means by which the modulation is accomplished is by a second tube, whose plate filament path resistance is varied in accordance with the speech frequencies applied to its input terminals. By properly interconnectng the plate or output circuit of the oscillating and modulating tubes, and by further converting the high voltage plate power supply to the two tubes from a constant potential to a constant current system the variation in amplitude of the high frequency current may be made to follow out faithfully the variations impressed by the modulating source. This system is advantageous, since the completeness and purity of modulation is practically independent of the frequency of the oscillating system.

The line may be connected to the source of oscillations in a number of ways, of which probably the most convenient is by inductive coupling.

Submarine Cable Testing.

We have received a supply of "Darby and Fisher's Students' Guide to Submarine Cable Testing," fifth edition, one of the most popular books on this important subject.

The book contains 240 pages and deals with all tests and measurements made in modern submarine cable practice. An appendix is included which contains answers to all questions presented in the main work.

The price of the book is $4.50 and copies may be had from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON AND BLACK

And we can highly recommend it to our readers.

$2.50 per copy.

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QUESTIONS AND ANSWERS

Thompson and Thomson.

S. L. T.—Silvanus P. Thompson, the author of "Elementary Lessons in Electricity and Magnetism," was born in New York on June 19, 1851, and died in London, England, on June 13, 1916.

Elihu Thomson was born in England, in the year 1853, but came to the United States with his parents when he was five years of age. In association with Prof. E. J. Houston, he was instrumental in the organization, in the year 1880, of the Thomson-Houston Company, later the General Electric Company.

J. J. Thomson was born in England, in the year 1856. The greater part of his researches were made while he was Cavendish Professor of experimental physics at the University of Cambridge.

Sir. William Thomson (Lord Kelvin) was born in Ireland, in the year 1845. He was long connected with the University of Glasgow, and from 1856 until 1880 was closely identified in an engineering capacity with submarine cable telegraphy.

First Morkrum Operator.

L. A. J.—The young lady who was first to operate a Morkrum printer keyboard in actual service was Miss Hodgson. That was in the year 1910 on a Postal Telegraph Company's circuit between New York and Boston. Miss Hodgson is still employed in the New York office of the Postal Company.

Adjustment of Morse Key.

S. L. E.—The adjustment of the compression spring of a Morse key should be regulated to suit the requirements of the individual operator. Some operators prefer a "light" and some a "stiff" tension of the spring. Each man should adjust the spring of the key he works regularly, so that the signals sent out will be *solid*, but not *sticky*. A stiff spring adjustment tires the arm sooner than a light adjustment. A good rule to follow is to maintain an adjustment which will allow you to send your very best Morse at a good rate of speed for an hour or more without tiring.

Frequency of Alternating-Current Generator.

S. A. S.—Alternations equal the number of poles of the generator multiplied by the revolutions per minute of the armature. Cycles equal the number of pairs of poles multiplied by revolutions per second of the armature. Sixty cycles are equivalent to 120 alternations.

Inductance and Capacity.

CHARLES D.—Inductance (L) in microhenries equals the inductance (L) in centimeters divided by one thousand. One thousand centimeters equals one microhenry.

Capacity in centimeters divided by 900,000 equals the capacity in microfarads.

The Phonodeik.

W. L. I.—Referring to the article which appeared in the November 16, 1919, issue of TELEGRAPH AND TELEPHONE AGE, entitled "An Oscillographic Study of a Howler Set," our inquirer asks for further information about the phonodeik device therein mentioned.

In this instrument, which was developed by Professor D. C. Miller, a horn is employed to direct sound waves upon a sensitive diaphragam, whose vibrations are transmitted to a small mirror. A beam of light is reflected from the mirror and falls upon a moving photographic film. As the mirror vibrates the reflected beam moves correspondingly and a sinuous trace of the sound wave is produced on the film and this may be developed to form a permanent record.

Lamp Resistances.

J. S. K.—The hot resistance of tungsten lamps is, approximately: 25-watt, 478 ohms; 60-watt, 203 ohms; 75-watt, 162 ohms; 100-watt, 122 ohms; 150-watt, 80 ohms, and 200-watt, 61 ohms. These figures are obtained from rated wattage and current consumption.

S. O. S!

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SHOP TALK.

BY THE OBSERVER.

CIRCUITS CARRYING AUTOMATIC SIGNALS.

At the present time, hardly a day passes that repeater attendants are not called in to watch for a "scrape" on circuits carrying automatic printer signals. This state of affairs did not exist during the days when the Wheatstone system was used or during Barclay printer days.

One is naturally prompted to seek a reason therefor. Wire chiefs and repeater attendants who are addicted to thinking along the lines of their work have undoubtedly discovered the reason before now. They have re-discovered an old difficulty in a new form—a difficulty that was always to the fore in Morse duplex and quad working.

I shall avoid a deal of explanation and of introductory remarks by stating that, in my opinion, the whole trouble is due to working the points of the combination relay too close.

In my observations, I have often noticed that the adjustment of the relay is such that the movement of the armature is too small to be noticeable without employing a magnifying glass.

As is well known, the movement of the armature of the combination relay causes the action of the auxiliary relay armature; or what is, actually, the transmitter of marking and spacing currents sent to line. Therefore, when there is a bind within the combination relay there will necessarily follow a consequent failure in the auxiliary relay. To attempt to adjust the auxiliary relay points as close as those of the combination relay would mean frequent arcing at the contact points; blown fuses; imperfect signals, and defective service generally.

It is important to bear in mind that the transmitting relay points, although much more widely adjusted than are the combination relay points, constitute the real transmitter, and that it will perform its work satisfactorily unless the combination relay fails properly to function.

It is obvious also that although the points of the transmitter relay are wider apart than are the points of the combination relay, the transmitting relay armature must reach its marking and its spacing positions at the same time the primary instrument's armature reaches like position. If this is not the case, trouble is immediately in evidence.

It has been said that the cause of binds in the combination relay is due to failure to sufficiently and frequently burnish the points. That there is not much foundation for this supposition should be apparent when it is remembered that undue sparking at the points of the combination relay is very rare. Burnishing of points does no harm; but in the case of the combination relay the chief benefit derived from frequent burnishing is that, in the act of burnishing, the armature comes in for a degree of attention and adjustment which forestalls binding.

Some attendants may say that they rarely have "hangs" in their sets, although they adjust at two one-thousandths of an inch. If this is true, do not depart from the practice. Like the Scot, however, "I hae ma doots." I have heard of a case where the two one-thousandths was not attempted until such adjustment was demanded, and that scrapes then occurred which had not previously developed at that point.

I am strongly disposed to do what I can to harmonize existing rules and regulations with experience. The following should be safe procedure: If you find that your relay works better by making the air-gap a trifle wider than has been your custom and that where formerly you discovered hangs you now have no difficulty, the thing to do is to widen the gap.

There are several repeating offices in a circuit, and it is a disagreeable fact that sometimes scrapes come in during periods when interruption to the circuit is both serious and costly. Time is lost that might have been saved had repeater attendants used their talents in devising preventives rather than standing pat on the specifications. The specifications were written by able engineers as a guide to men in the field; but it is still expected that every man on post at any point shall exercise all the initiative and gumption at his command.

When we talk about adjustments and measurements of the order of thousandths of an inch, the word "wider," as used in this little sermon, must not be interpreted as giving undue license in "opening up."

Those attendants who hope to acquire reputations as experts should have no difficulty in getting the right idea.

I like to think that these ideas are what the higher officials of the company have in mind when they admonish us to co-operate—those of us who are out on the firing line dividing up the twenty-fours of each day the year round—and undoubtedly these thoughts are close to our daily work.

Telephones and Telegraph Offices in Costa Rica.

On December 31, 1918, there were 1,514 telephones and 2,291 miles of telephone wire in operation in Costa Rica, according to the latest statistics available. On the same date 122 telegraph offices were listed. Statistics, which do not include cablegrams and radiograms, show that 416,831 telegrams were sent during that year (1917-1918), the revenue received being 223,045 colons. (The normal value of the colon is $0.47.)

Telegraphs in South Africa.

During the year 1918, the number of telegraph offices increased from 1,703 to 1,738, and the number of messages from 6,174,888 to 6,619,635.

The Old Wire Chief says: "If every man knew his range and confined his aim to that, a great many big jobs would remain undone."

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL.

COL. ALBERT B. CHANDLER, for many years president of the Postal Telegraph-Cable Company, New York, and now retired, is living, during the winter months, at Aiken, S. C.

J. CONRAD FULLER, assistant telegraph engineer of the Federated Malay States, is expected to arrive in the United States in the near future for the purpose of investigating American telegraph and telephone systems.

JOHN T. NEEDHAM, manufacturer of pneumatic tube systems, left New York on January 10 to spend several days in Chicago and Kansas City, where he has under way a large amount of pneumatic tube work for the Western Union Telegraph Company.

MRS. CAMP, wife of W. J. Camp, assistant manager of the Canadian Pacific Railway Company's telegraphs, Montreal, Que., had the misfortune, on January 6, to fall on an ice covered sidewalk, breaking her arm near the shoulder. Mrs. Camp was immediately taken to a hospital, and recovery has been so satisfactory that it is expected she will be able to go to her home within a short time.

GEORGE D. PERRY, general manager of the Great North Western Telegraph Company of Canada, accompanied by Mrs. Perry returned to Toronto in December, from a business trip to the Pacific coast.

FREDERIC M. MCCLINTIC, expert commercial, press and broker telegrapher, and who during the late war was a captain in the Signal Corps, has returned to private life and is now secretary of the Wyoming Valley Ice Company, wholesale distributors, with headquarters at Wilkes-Barre, Pa.

W. L. JONES, president of the Postal Telegraph-Cable Company of Texas, was a New York visitor on January 5. Mr. Jones reports a steadily increasing volume of telegraph business in his territory.

IGNACIO GALINDO, technical chief, and Fernando Rodriguez Ruiz, supply chief, of the Mexican government telegraph system, City of Mexico, are in New York investigating telegraph systems, operation, and materials.

POSTAL TELEGRAPH-CABLE COMPANY.

C. A. COMSTOCK, assistant to the general manager, left immediately after the New Year on a trip to Indiana, where he will visit a number of offices. He will be away for several weeks.

F. J. KERNAN, auditor, is back at his desk after being confined to his home for several weeks with a severe attack of grip.

L. R. THOMAS, who has been assistant superintendent of the sixth district, western division, since August 1, 1919, has been appointed superintendent of that district with headquarters at Chicago, effective as of January 1, 1920. Prior to his appointment as assistant superintendent he was chief clerk to general superintendent Collins.

J. P. O'DONOHUE, division electrical engineer, eastern division, is visiting the larger offices in Pennsylvania.

AS A RESULT of the destruction by fire of the switchboard of the Memphis Telephone Company, the contract whereby that company handled the local distribution of the Postal's long distance telephone service has been canceled. The necessary switchboard has been installed, and laterals are being constructed, so that all former patrons will now be reached direct from the board in the Postal office.

D. H. GAGE, of the electrical engineer's office, has returned from an inspection trip which covered the offices of central New England.

AT A RECENT MEETING of the stockholders of the North American Telegraph Company, W. H. Eustis was elected president, filling the vacancy created by the death of H. A. Tuttle. The other officers elected were: A. S. Harris, secretary, and E. S. Hales, treasurer.

IMPROVEMENTS are being planned for the St. Louis, Mo., operating department. W. L. Simpson, division electrical engineer, and S. H. Mudge, district superintendent, recently spent several days in St. Louis going over plans.

THE SUPERINTENDENT'S OFFICE of the first district, Southern Division, was in November last moved from Richmond, Va., to Charlotte, N. C.

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THE COMPANY has opened a new office in the Cotton Exchange, Macon, Ga., with W. J. Cloyd as manager.

ALFRED M. BEATTY, who retired from the service as manager at Atlanta, Ga., at the end of 1919, was presented with a handsome chest of silver as a token of esteem from employees of the Atlanta office. Mr. Beatty has been manager of the Atlanta office since 1905. The presentation address was made by G. W. Oliver of the Atlanta staff.

HARRY S. PIERCE, manager of the Evansville, Ind., office of the Postal Telegraph-Cable Company, handles one manager's share of telegrams containing code words. At times he has had difficulty advising patrons the name of the code in which the patron's message has been transmitted, and as a result he has become quite an expert in deciphering codes. Recently he figured out the meaning of the words "swak" and "lamk," which appear in night lettergrams occasionally. His solution is that the former word means "sealed with a kiss," and the latter "love and many kisses." The first letter of each word: Easy. Night lettergram traffic is steadily growing.

MANAGERS APPOINTED: H. H. Julian, Little Rock, Ark.; E. H. Jarrell, Bowling Green, Ky.; William F. Beyer, Richmond, Ind.; Joseph Krasnicky, Waukegan, Ill.; Phyllis Hollister, Fort Dodge, Iowa; L. A. Dudley, San Diego, Calif.; Lovell D. Manley, Union City, Tenn.; H. L. Albert, Peabody, Kan.; M. E. Bourke, Galesburg, Ill.; J. O. Young, Atlanta, Ga.; G. C. Wood, Orangeburg, S. C.; E. D. Hebbard, Newton, Iowa; C. M. Williams, Pine Bluff, Ark.; Nellie Hutchins, Grinnell, Iowa.

New York Postal Notes.

WILLIAM FRANCIS WRIGHT, who commutes from Asbury Park, N. J., has joined the ranks of the benedicts.

EDWARD F. DUFFY has left the service to take charge of a department recently moved from Washington to New York for the United States Shipping Board, in which service Mr. Duffy was employed during the late war.

THOMAS J. DUNN, manager of the telegraph office in the morning *World* newspaper office is absent on a vacation with the object of recuperating his health.

RECENT VISITORS in the main operating room included, Mortimer O'Connell, of Ballinskelligs cable station, Ireland, accompanied by J. O'Connell, of the police department, New York, and "Jack" Dempsey, one of our former employees, now of the tax department, New York.

MR. and MRS. A. E. ROWLES, have resigned from the service and will make their home on a ranch in Wyoming, where they formerly resided.

THE SYMAPATHIES of the entire operating staff are extended to F. F. Norton upon the sudden death of his wife.

MRS. M. A. HEYER, sister of the late S. A. Coleman, of the operating department, died in Florida recently, where she had been living during the winter months.

WILLIAM WOLFF of the first Chicago bonus team has returned after an illness of two weeks.

MRS. J. MATTHEWS and G. J. MURPHY of service department are on the sick list.

J. R. ROSS, manager, and C. W. SHERMAN of the Troy, N. Y., office were recent visitors in the operating department.

A. F. KAVANAUGH, chief clerk, recently visited Philadelphia, renewing old acquaintances.

RALPH CARR, loop chief, visited his old home in Pennsylvania during Christmas week.

H. G. FUNK, manager of the *Evening Sun* office, spent the holidays at Lakewood, N. J.

JAMES J. REILLY, for many years manager at 163 East 125th Street, has tendered his resignation to accept an important position with the Board of Education. Mr. Reilly has the good wishes of his many friends in the service.

W. H. HARRISON, of the Quarantine Station office, is on the sick list.

JOE ZINNO, who has just returned from a trip to Italy, has been temporarily assigned to duty in the telephone department at 253 Broadway.

OWING TO her mother's illness, Mrs. C. F. May, manager of the Hotel Belmont branch, was obliged to leave for Pittsville, Wis., recently.

MRS. L. B. WHEELER has resumed charge of the Mt. Vernon office after a short absence due to illness.

THE FOLLOWING TRANSFERS AND ASSIGNMENTS are reported by City Manager McDermott: C. P. Marshall, operator in the marine department; Miss E. Nord, from the McAlpin to 35 Nassau Street; Miss R. Berkowitz, from 30 Church Street to 45 Broadway; Mrs. A. B. Slocum, to 104 Wall Street; Mrs. M. Van Pattem, as operator at 621 Broadway; H. Vernon, from 724 Seventh Avenue to 83 Gold Street; M. Kessler, as night operator at 724 Seventh Avenue; Irving Rice, from 20 West 45th Street to the Hotel Endicott; J. Del Maesro, from 45 Broadway to 10 East 42d Street; Mrs. A. L. Faulkner, as night operator in the Hotel Astor.

Chicago Postal Notes.

W. R. SKEELS, assistant chief operator, spent the Christmas holidays at his old home in Grinnell, Iowa.

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JAMES K. O'LEARY, for many years operator in the service of this company, died on November 16, last, after a long illness.

J. D. MURPHY, of this office, has gone to Albuquerque, N. M., to visit his wife, who has been spending the winter there for the purpose of improving her health.

FROM INDICATIONS here it would appear that in the near future telegraph men in large numbers will be listed among those who are owners of the ever joyful automobile. Roy C. Blackwell, general quad chief, and A. E. Wilder, western quad chief, have recently purchased new machines. Mr. Blackwell is said to have become so expert in operating his Chevrolet that he uses it, instead of his dogs, to run down rabbits.

Philadelphia, Pa., Postal.

THE BRANCH OFFICE at 6 North 40th Street, West Philadelphia, was the scene of a fire recently which threatened destruction of all equipment, but through energetic work on the part of the fire department and employees the damage was confined to the switchboard, and necessary repairs were made so promptly that service was not interrupted over an hour.

LOUIS N. ALMES, who recently returned from overseas duty with the 28th Division, is now employed as special officer of the company in the burglar alarm department.

MISS A. C. CONWAY, formerly time-keeper in the main office operating department, has been transferred to the superintendent's office as clerk. Miss Conway is succeeded by Miss F. Pencer.

Buffalo, N. Y., Postal.

FRANK J. MORIARTY has been appointed audit clerk in the office of Superintendent Reynolds, succeeding R. D. Mahaney, who recently resigned to accept a position with the City of Buffalo. Mr. Mahaney has been with Superintendent Reynolds for seven years.

New appointments in the 5th District are as follows: W. H. Carney, operator, Binghamton, N. Y.; James McGraw, lineman, Watertown, N. Y.; J. Moore, lineman, Buffalo, N. Y.; F. A. Weitzel, lineman, Olean, N. Y.

The latter relieved J. M. Chapman, who is on leave of absence.

Boston, Mass., Postal.

E. C. FOLEY has been appointed manager, of the Broad Street office in the cotton district.

RALPH E. KELLEM has been appointed manager of the City Hall Avenue office.

DIRECT NEW YORK Morse circuits have been connected to the Devonshire Street, Essex Street and City Hall Avenue branches, to take care of largely increased traffic.

THE BRANCH OFFICE at No. 263 Summer St., in the wool district, has been remodeled. New equipment has also been installed. The office is in charge of Miss Eugene Henderson.

FRED M. SIMMS has been detailed to the manager's office on special duties.

San Francisco, Calif., Postal.

E. B. BOYDEN has been appointed cashier of the main office. Mr. Boyden is an old-timer in Coast territory. Until recently he was manager of the company's office at San Diego, and fifteen years ago was employed as operator in the San Francisco main office.

W. S. VAWTER has been appointed assistant manager of the main office, where he will be of valuable assistance to Manager George W. Holt.

R. S. SHELLEY, of the quadruplex department, was called to Rawlins, Wyo., shortly before Christmas on account of the serious illness of his wife.

G. C. WOODWARD, assistant night chief operator, spent the Christmas holidays at his ranch near Sacramento.

H. C. SHAW, superintendent of the first district, is enjoying a two weeks' vacation.

B. W. FIELDS, division electrical engineer, recently made a trip to Los Angeles in connection with the San Francisco-Los Angeles telephone circuit, which was opened for service a short time ago.

J. H. FITZGERALD, operator, spent the holidays at Sacramento. Before coming to San Francisco Mr. Fitzgerald was employed as operator at Sacramento for twelve or fifteen years.

THE NEW OFFICE at Portland, Ore., is progressing rapidly and will soon be ready for occupancy.

HOWARD L. KRUM, chief engineer of the Morkrum Company, Chicago, was a New York business visitor on December 31. Mr. Krum stated that many new and important developments in printing telegraph extension are under way.

ROGER FISON, during the year 1919 advertising representative for TELEGRAPH AND TELEPHONE AGE, has entered the service of *The Electrical Review*, one of the largest electrical weekly journals in this country. Mr. Fison becomes advertising representative with territory including New York City and cities in the New England States. For many years Mr. Fison was employed in the service of the Associated Press as operator, and later as division editor.

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WESTERN UNION TELEGRAPH COMPANY.

NEWCOMB CARLTON, president, sailed for Europe on the *Mauretania* on December 30. Mr. Carlton will remain in Europe several weeks in connection with submarine cable matters.

F. E. D'HUMY, central office engineer, is in Florida on business in connection with the new cable station at Miami.

S. M. BARR of the plant engineer's office is in Kansas City in connection with the belt conveyors to be installed in the new Kansas City office.

I. S. COGGESHALL, of the testing and regulating department, Boston, Mass., has been transferred to Vice-President Fashbaugh's office as engineering assistant.

BALTIMORE, MD., has been made a division office, reporting direct to the general manager. The title of V. J. Albert, manager, has been changed to that of city superintendent.

THE INCREASES IN PAY to the extent of fifteen per cent for employees in service one year, and ten per cent for those in service six months, effective January 1, arrived at a time when additional income is particularly welcome on account of the continued high cost of living. More than thirty thousand employees participated in the increases, the sum involved being approximately $5,000,000.

J. A. BROOKS of the dispatching staff, New York main operating room, has been appointed a traffic inspector, Eastern Division.

ON DECEMBER 31, 1919, the Western Union Telegraph Company owned, controlled or operated 217,582 miles of pole line, 777,420 miles of iron wire, 577,465 miles of copper wire, 3,242 miles of land-line cables, and 22,993 nautical miles of ocean cables.

Western Union Earnings.

For the month of October, 1919, the total operating revenue of this company was $9,726,445, an increase of $1,543,499, while net operating revenue amounted to $2,622,892, an increase of $633,-278, and operating income was $2,243,575, an increase of $697,752. From January 1 to Octobr 31, 1919, total operating revenue was $84,335,891, an increase of $12,553,000, while net operating revenue was $21,128,855, an increase of $5,732,591. Operating income amounted to $17,039,873, an increase of $4,890,278.

Metropolitan Division.

J. F. NATHAN, commercial general superintendent, Metropolitan Division, with Mrs. Nathan and their two children, spent the Christmas holidays in Chicago, visiting with Mr. Nathan's mother.

J. R. HYLAND, district commercial suprintendent, first district, Metropolitan Division, spent the Chistmas holidays with his mother at Lincoln, Neb.

AT FIVE OFFICES in the Brooklyn district motorcycles are now used in the delivery of telegrams. As rapidly as the necessary staff can be procured and trained, other offices will be provided with motorcycle messengers.

New York Western Union.

MISS CATHERINE BOGLE of the service bureau and Charles Lang of Rochester, N. Y., will be married February 1, and will reside in that city.

MISS ANNA TWILLMAN and John Daly, of the cable office at 62 Broadway, will be married about February 14.

MISS M. DONAVAN, formerly wire chief of this office, died at Albany, N. Y., on December 27.

HORACE Y. STARR, formerly of the operating department and late pensioner, died at New London, Conn., on December 27.

C. W SAMUELS, formerly in charge of traffic, New York main office, and J. A. Brooks, of the dispatching bureau, have both been promoted to positions as division inspectors of the testing and regulating department.

LIEUT. COL. ALFRED E. LARABEE, United States Signal Corps, recently returned from overseas service, and formerly attached to the general staff in Washington, was shown through the operating department recently by F. S. O'Connor, office engineer. Colonel Larabee was accompanied by R. W. Morris of the American Telephone and Telegraph Company.

K. HASEGAWA, electrical engineer, Japanese government railways, Tokio, and Mr. Beenhouwer, Western Union representative in Holland, were visitors in the main operating room on December 22.

Western Union, Lake Division.

FOURTH DISTRICT.

JOSEPH HARLIN has been appointed manager of the office at Coshocton, Ohio, vice N. B. Foresman, resigned. Mr. Harlin was previously employed in the Pacific Division, and recently returned from foreign military service, having served as chief operator in the Paris, France, office of the Telegraph Division, American Expeditionary Forces.

E. B. OGELVIE, manager at Lima, Ohio, and C. E. Greshner, manager at Bellefontaine, Ohio, are reported recovering from illnesses which have confined them to their homes for some weeks.

M. F. ROBENALT, assistant manager at Akron, Ohio, has resigned from the service.

WILLIAM A. MOREY, chief delivery clerk, Day-

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ton, Ohio, died suddenly on December 21, of cerebral hemorrhage. Mr. Morey was in military service overseas, and but recently returned to his old position at Dayton.

S. E. HASTINGS has been appointed manager at Bay City, Mich.

O. W. FEXER has been appointed manager of the office at Cheboygan, Mich., vice S. E. Hastings, transferred.

W. R. LYONS, formerly manager at Grand Haven, Mich., has been appointed assistant manager at Grand Rapids, Mich.

J. P. PARMENTIER, district commercial manager, Green Bay, Wis. has resumed his duties after a fortnight's illness. He attempted to resume work too soon after a period of illness and suffered a relapse.

IN THE THIRD DISTRICT many plans are on foot looking to an increased volume of traffic. Recently the following additional independent offices were opened in this district: Blue Island, Ill.; Christopher, Ill.; Newton, Ill.; and Waupun, Wis. Four other offices are on the list for early opening.

HARRY GITHENS, night receiving clerk of the Western Union office at Dayton, Ohio, is the type of telegraph employee which brings to the telegraph business the good-will and friendship of those who use the wires. Manager C. E. Jones of the Dayton office recently received a letter of appreciation from the manager of the Dayton Chamber of Commerce, calling his attention to the courteous and intelligent treatment accorded an out-of-town business man who called at the office late in the evening to file a particularly urgent telegram.

MANAGER T. A. DARLING of El Paso, Tex., has in his delivery department a messenger whose performances answer the age-old inquiry, "What's in a name?" The boy's name is Pancho Villa, and his photograph shows him to be a black-eyed strategist of the type which thrives below the Rio Grande. Pancho is fifteen years of age, and as stated above, is a member of the Western Union messenger force at El Paso. When he goes out to get them he brings them back. The other day he brought in thirty-five. Now, thirty-five is a pretty good round-up for one day—especially for a boy of fifteen years. The plain truth is that Pancho brought in thirty-five answers to telegrams. It is not stated how many he delivered; but of those delivered he succeeded in lassoing answers to thirty-five in one day. Carranza could not do better.

THE RECEIVING COUNTER girls in the Western Union office at Fort Worth, Tex., are so popular with the company's patrons in that city that Christmas time is always seized as an opportunity by customers to send in a little of the sort of recognition that is appreciated. This year a Fort Worth business man, who happened to be in Los Angeles during the holidays, did not allow his absence from home to interfere with his customary Christmas greetings to the courteous and obliging telegraph girls. On December 24 there arrived at the Fort Worth office a large box of fruit and a box of California flowers to be distributed among the clerks.

S. GRAY, during the past two years manager of the Western Union office at Waco, Tex., on December 29 last was transferred to Shreveport, La., as manager. At Waco Mr. Gray built up an excellent reputation as a business getter, and during the period of his managership at that point made many friends for the telegraph company. His advancement to the larger field in the Shreveport district comes to him as a natural result of good work well done.

J. C. JONES, during the late war manager of the Camp MacArthur, Tex., office, and later manager of the North Third Street, Waco, Tex., office, has been appointed manager of the company's main office in Waco, Mr. Jones has had long experience in both railroad and commercial telegraph service. As manager of the North Third Street branch office Mr. Jones is succeeded by Morris French.

A Thoughtful Messenger.

George W. Keith, Jr., of the delivery department, Western Union Telegraph Company, Cincinnati, Ohio, sends in an interesting item concerning an accident which happened to a messenger boy working out of that office, who, for present purposes may be known simply as "No. 23."

It appears that recently while the boy was making an attempt to break all previous records for quick delivery of a telegram, he had the misfortune to go crashing through a glass door. One of his wrists was severely cut and the wound bled profusely. The manager of the office where the accident occurred gave the boy first aid by wrapping a towel tightly around the wrist above the cut. The following morning the gentleman received a neatly wrapped package containing a towel freshly laundered and accompanied by a note from the messenger thanking him for his kindness.

When he learned of the boy's action, Mr. Keith made of it an object lesson in courtesy for his other boys, calling attention to the probability that in the case of most boys the damaged towel would have been thrown away without further thought.

Operator Forges Money Transfers Goes to Jail.

ALBERT J. KELLY, a telegraph operator employed at Wichita Falls, Tex., forged four money transfers in June, 1919, raising sums of money thereon. After his trial on December 16 at Tulsa, Okla., Kelly was sentenced to three months in jail and to pay a fine of $500.

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Western Union Pacific Division.

SAN FRANCISCO and Los Angeles offices have been established as divisional offices, effective January 1, and will hereafter be under the direct jurisdiction of the general manager of the Pacific Division. The titles of Managers W. R. Edmondson of San Francisco and J. M. Green of Los Angeles have been changed to that of city superintendent.

M. T. COOK, general manager, during December visited the offices at Los Angeles, San Diego, Santa Barbara, Portland and Salem.

INTENSE COLD WEATHER in the States of Washington and Oregon, with an unusually heavy fall of snow, almost paralyzed telegraph communication in that territory during two days in December. Fortunately, wire trouble was not generally severe, but the message delivery forces at many points encountered conditions which made prompt handling of telegrams impossible. At Portland, Ore., Manager Williams, as soon as the storm began, chartered all available sleighs in the city—seven in all—for the use of the delivery department. Subsequently the transportation monopoly was broken when the police department commandeered two of the sleighs.

A NUMBER of new branch offices have been opened in office buildings in the large cities of the division. Generally the offices are established on floors a few flights up, and are known as "building" branches. Well selected staffs and neatly uniformed girl messengers serve in this new class of office.

Telegraph Reducing Volume of Train Mail.

An extensive manufacturer of paints in San Francisco recently stated to W. R. Edmondson, manager of the Western Unian Telegraph Company, San Francisco, that modern business conditions are such that the value of the telegraph service over that of ordinary mail service is becoming more evident every day. Short stocks and changing prices, together with the fact that all factories are crowded with work, make the telegraph an absolute necessity in carrying on business. The manufacturer quoted stated that in his offices handling correspondence by wire is gradually replacing the use of train mail letters. His telegraph account has grown from a small figure to more than $3,000 per year.

MISS ELEANOR CARROLL, twenty-one years of age, manager of the Western Union Telegraph Company's office at Fredonia, N. Y., was on December 24 shot and instantly killed by Joseph Huels, twenty-three years of age. Huels was a returned soldier, and it is stated that the shooting was the result of Miss Carroll's refusal to marry him. Huels later committed suicide.

Western Union, Manchester, N. H.—Eighth District, Eastern Division.

JOSEPH J. FLANAGAN, manager of the Bangor, Me., office, has returned to duty after a three weeks' leave of absence on account of illness in his family.

ADELARD J. DAMIEN of the Bellows Falls office is absent on a three months' furlough. Mr. Damien has been in the service continuously during the past twenty-five years.

HARRY H. WHITE, manager of the Portland, Me., office has returned from a two weeks' hunting trip in Aroostook County.

MISS W. F. THOMPSON is acting manager at Bennington, Vt., vice Irva G. Goss, on a vacation.

MARTIN B. PETIT, manager at Portsmouth, N. H., has been granted a leave of absence for several months.

JOHN J. BRENNAN of Rochester, N. H., has been appointed manager at Portsmouth, N. H., vice Martin B. Petit, on leave of absence.

MISS L. M. HALL has been appointed manager at Springfield, Vt.

The Electrical Aid Society of Philadelphia.

The thirty-second annual meeting of the Electrical Aid Society was held in the drawing rooms, 1620 North Broad Street, Philadelphia, at 8 p. m., January 16.

Nomination and election of officers for the following year were conducted, also amendments to two of the Society's by-laws were acted upon.

After the business session the rooms were thrown open for entertainment. Dancing continued until 1 a. m.

The officers of the Society during 1919 were: C. A. Huver, president; J. A. Chapman, vice-president; W. E. Vanarsdall, recording secretary; R. C. Murray, financial secretary, and J. H. Wilson, treasurer.

Death of Shirley M. English.

When the announcement was flashed over the wires on January 6 that Shirley M. English, general manager of the Western Union Telegraph Company at Dallas, Tex., had died of acute indigestion, after an illness of only three hours, the entire fraternity felt as though it had lost one of its best friends. Mr. English was known throughout the country as a benefactor. Everyone with whom he had dealings in his long telegraph career felt that he owed Mr. English a debt of gratitude for the encouragement received at his hands.

Mr. English was born at Mobile, Ala., March 31, 1862. He entered the telegraph service as messenger when twelve years of age, and had been successively manager of the Mobile Telephone Exchange, secretary of the Mobile and Gulf Telegraph

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Company, superintendent of the Mobile City electric light plant, quadruplex chief of the Western Union Telegraph Company, New Orleans, La., chief operator of the Postal Telegraph-Cable Company at the same place, electrical engineer of the Postal Telegraph-Cable Company of Texas, during the construction of its lines, and for many years afterwards its president and general manager. Five years ago he became general manager of the Gulf Division of the Western Union Telegraph Company, which position he held at the time of his death.

Mr. English was a public spirited citizen of Dallas and was interested in various enterprises, and was at all times a prominent figure in the promotion of the best interests of the State of Texas. He was widely known as one of the foremost figures in telegraph circles, and his untimely death is a distinct loss to the service. He is survived by Mrs. English, two daughters and two sons.

Death of Edwin F. Howell.

Edwin F. Howell, secretary of the Serial Building Loan and Savings Institution, for over twenty-five years, died at his home in Brooklyn, on January 6. Mr. Howell had been in failing health for sometime past but the announcement of his death came as a shock to a wide circle of friends.

Mr. Howell was born in 1854 at Carbonear, Newfoundland, and came to New York in 1878. He was a member of the 195 Broadway force for many years, for eleven of which he tested all applicants for appointments. He occupied many important positions in the main operating room. He was an expert cable, as well as Morse operator, and his services as a telegraph man were of great value to the company.

Mr. Howell had been identified with many movements organized to advance the interests of the fraternity. He was one of the charter members of the Telegraphers' Aid Society, Magnetic Club and the Serial Building Loan and Savings Institution, serving as secretary of the latter for over a quarter of a century. His work in this capacity is a monument that will endure for all time. He was instrumental in over one thousand telegraphers in New York and vicinity obtaining homes of their own, and so thoroughly had he mastered the intricacies of loan associations that his advice on banking and loans was sought by institutions of this character in all sections of the country. He was the author of many laws pertaining to building and loan associations and he was frequently consulted by various state legislatures as to his views on pending measures of interest to banking and loan organizations.

The Old Wire Chief says: "It still remains an open question whether socialism, government ownership or any other of the proposed means of ending the differences between labor and capital will prove to be a panacea for the aberrations and idiosyncrasies of human nature."

RADIO TELEGRAPHY.

Radio Corporation of America Notes.

THE EXECUTIVE OFFICERS and operating officials of the company are: Edward J. Nally, president; Charles J. Ross, secretary and comptroller; George S. de Sousa, treasurer; John W. Griggs, general counsel; Lewis MacConnach, assistant secretary; Marion H. Payne, assistant treasurer; E. F. W. Alexanderson, chief engineer; Roy A. Weagant, consulting engineer; Alexander E. Reoch, plant engineer; Dr. A. N. Goldsmith, director of research; David Sarnoff, commercial manager; G. Harold Porter, assistant commercial manager; W. A. Winterbottom, traffic manager; Edward B. Pillsbury, general superintendent, and Melvin C. Steiner, purchasing agent.

MAJOR CHARLES P. BRUCH and Capt. Powhatan Page, of the Pan-American Wireless Telegraph and Telephone Company, who recently left New York for Buenos Aires, arrived there January 9th via Panama.

G. S. DE SOUSA, treasurer, who was recently injured in the subway, is recovering and expects to return to duty soon.

IRA J. ADAMS, of Cleveland, has been appointed patent attorney of this company.

LEE LEMON has been elected vice-president and general manager of the *Wireless Press*.

JOEL E. HUDSON, of the engineering staff, Marion, Mass., station, was married, January 1, to Miss Edith Waters of Marion.

MISS MARY ROSE EWING, of the auditing department, was married, Christmas eve, to John H. Eckardt, of New York.

THE MARCONI WIRELESS TELEGRAPH COMPANY OF CANADA, LTD., has purchased for its uses the building occupied by the Montreal Stock Exchange, Montreal, Que. A school for training radio operators is to be opened in the new building. The company also is reported to have in hand the erection of a new powerful long distance station at Vancouver, B. C., the cost to be approximately $2,000,000.

JOHN V. L. HOGAN, president elect of the Institute of Radio Engineers, is a Fellow of the Institute and is manager in New York for the International Radio Telegraph Company. Mr. Hogan has been actively identified with the Institute since its inception, having served on various important committees, and during the past four years as vice-president. During the past ten years Mr. Hogan has written a large number of original technical papers dealing with radio invention and development, and is one of the recognized American authorities in radio science.

ERNST F. W. ALEXANDERSON, vice-president

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elect of the Institute of Radio Engineers, is a Fellow of the Institute, and is a winner of the Institute's gold medal for important radio research. He is the inventor of the high frequency alternator widely used in radio long distance transmission, which bears his name. During the past ten years Mr. Alexanderson has presented before the Institute of Radio Engineers and the American Institute of Electrical Engineers a number of very important papers dealing with radio inventions.

SAVEUR BERGIN, radio operator on the Fabre liner *Madonna,* bound from a Swedish port to New York, was swept overboard and drowned when the vessel was in mid-ocean on January 5. The ship encountered heavy weather, high waves at times sweeping her from bow to stern.

IN URUGUAY, the National Council of Administration is seeking governmental authorization to contract a loan of $200,000 (Uruguayan gold) from the Bank of the Republic, in order to carry out improvements in the wireless telegraph service.

A PAPER on "The Use of Ground Wires at Remote Control Stations," by Lieut. Commander A. Hoyt Taylor and Lieut. A. Crossly, was presented before the Institute of Radio Engineers on the evening of January 7, at the Engineering Societies Building, New York. The paper deals with the increasingly important problem of simultaneous transmission and reception of sustained and damped wave signals at the same and different wave lengths. Important and valuable data on recently installed stations of this type were presented.

RADIO OPERATORS stationed at the Belle Isle radio station, Canadian Atlantic coast, recently had an uncomfortable experience when the government steamer which was to deliver their winter provisions foundered. Another steamer, which was chartered to carry over the provisions, ran into bad weather and ice-packs, again delaying delivery. Fortunately the three operators by means of their radio apparatus were in a position to communicate with the mainland and make an appeal for aid which urged all possible haste in sending relief.

IN BOLIVIA the wireless telegraph service has been divided into three zones with central stations at Riberalta, Viacha and Yacuiba.

IN CONNECTION WITH the Airco Air Service between London, Paris, and the Hague, Holland, a wireless telegraph installation is to be established at the headquarters of the Aircraft Transport and Travel Company, at Westminster. The object is to provide communication with machines while in flight.

THE REPORT OF traffic handled on the western front during the late war by the Signal Corps of the American Expeditionary Forces, states that 310,665 enemy radio messages were intercepted and 176,913 radio bearings taken on enemy stations.

DURING THE EARLY PART OF THE WAR the Naval Communication Service of the United States operated fifty-five radio stations along the coasts of the United States and in United States possessions. At that time (January, 1917) the Navy had only 1,031 radio operators in its service. Later the Navy took over fifty-nine commercial radio stations, and when the armistice was signed there were 3,400 radio students under instruction—operators being graduated at the rate of 200 each week. A total of 7,000 radio operators completed their training in this work. The year before the war the Navy Department handled approximately 125,000 radio messages, of an average of twenty-five words each. From April 6, 1918, to April 6, 1919, approximately 1,000,000 dispatches of an average length of thirty words were handled by the Department.

RADIO TELEGRAPH service was begun between England and Sweden on November 19. The tariff is the same as that charged for submarine cable messages.

E. H. ARMSTRONG, late major in the United States Signal Corps, read an important paper before the Radio Club of America, New York, on the evening of December 19. The subject of the paper was, "A New Method of Receiving Weak Signals for Short Waves."

Unidentified.

Telegraph cashiers handling money transfers have one common experience which there seems little probability of avoiding. It is when transfers are received authorizing the payment of money upon identification to a payee who is a stranger in the city, or who does not happen to know some person the cashier knows.

Recently, in Indianapolis, Ind., an undertaker having a place of business on the outskirts of the city, received notice that a money transfer had been received for him at the telegraph office. When he arrived at the cashier's window and learned that he would have to be identified before receiving the money he was much worried. First, he presented the names of some of the persons he knew out on the fringe of the big city, but the cashier could not recollect having met any of them.

The case seemed hopeless when, suddenly, the undertaker had a happy thought. The purpose for which the money was telegraphed intimately concerned the affairs of a third person; the thing to do was to bring him before the doubting cashier so he might know it was safe to turn over the money to the payee.

As the idea took shape in the mind of the undertaker he exclaimed to the cashier: "I'll tell you what I can do! This money is to pay the railroad transportation charges on a corpse. I'll bring in the corpse, so you may identify him yourself."

The cashier somehow felt that the matter had been investigated far enough, and took the man's receipt for the money.

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THE TELEPHONE.

J. P. DOWNS, during the past ten years general superintendent of traffic for the Pacific Telegraph and Telephone Company, has been transferred to New York to assist the management of the New York Telephone Company with its traffic problems. Prior to leaving San Francisco Mr. Downs was given a luncheon at the St. Francis Hotel by his late associates.

AT THE PRESENT TIME there are more than 30,000 employees of the Bell Telephone System who are either actual owners of American Telephone and Telegraph Company stock or who are paying for stock out of their wages.

REPORT OF THE TELEPHONE INDUSTRY.

According to the report about to be issued by the Bureau of the Census showing the result of the census of telephones covering the year 1917, there are 53,234 separate telephone systems and lines. These lines and systems operated 28,827,188 miles of wire in the United States—enough to girdle the earth at the equator 1,153 times—and connected 11,716,520 telephones and 21,175 public exchanges. The messages or "talks" sent over these wires aggregated the stupendous total of nearly 22 billion, or, to be exact, 21,845,722,335. Figured on the estimated population of the country in 1917 this gives 211 messages per annum to every man, woman and child.

The industry in 1917 gave employment to 262,629 persons of whom 171,119, or over 65 per cent, were women. The sum paid out in salaries and wages amounted to $175,670,449. These employees operated plants and equipment valued at $1,492,329,015, which yielded operating and nonoperating revenues of $391,499,531.

The report discusses the development of the telephone industry, telephone equipment and traffic; offers interesting comparisons between the Bell and other systems, and between the telephone system as a whole and the telegraph system; and gives important financial statistics of the industry. Detailed figures are presented for 1917 by states and geographic divisions and comparative statistics for earlier years The statistics for 1917 are believed to be more accurate than for any previous census, due to the uniform system of accounts provided for telephone companies by the Interstate Commerce Commission, which has been in use since January 1, 1913.

The Bell telephone system controlled over four-fifths of the total wire mileage, employed over three-fourths of the employees of the industry, paid over four-fifths of the total bill for salaries and wages, and received nearly four-fifths of the total revenue.

Over three-fifths of all the telephones in the United States bore the "Bell" sign, and two-thirds of all persons who were "wanted on the wire" were wanted on a Bell wire. The dominating part that the Bell system plays in the industry may be further illustrated by the fact that of all the other systems reported, 96.1 per cent reported annual incomes of less than $5,000.

Comparisons with previous censuses bring out in a striking way the remarkable development of the industry. During the decade 1907-1917 wire mileage increased 129 per cent, the number of telephones 102.8 per cent, the number of messages 90.5 per cent, for systems having incomes of $5,000 or more.

A comparison by geographic divisions brings out the fact that considerably more than one-half of the telephone systems reporting annual incomes of $5,000 or more in 1907 were located in the Middle West, while systems and lines reporting incomes of less than $5,000 were found in the largest numbers in the western states of the central group.

The financial statistics of the report show that while the revenue of the telephone companies has more than doubled during the decade 1907-1917, the expenses have increased at an even more rapid rate. Much of the increase in expenses was due to increase in salaries and wages paid. These had advanced from 47.4 per cent of the total expenses in 1912, to 54.2 per cent in 1917. For systems reporting annual incomes of more than $5,000 in 1917, the average total revenue per telephone was $38.41, average net income per telephone $6.13 and average surplus per telephone $1.46.

This report of the telephone industry is part of the "Census of Electrical Industries" which was taken in 1918, covering the operations of the fiscal year 1917.

The first census of the telephone industry was taken in connection with the decennial census in 1880, only two years after the first public telephone exchange was opened for business at New Haven, Conn., on January 25, 1878. In 1890 a census of telephones was again taken with the regular decennial census, but for 1902 and for every fifth year since, a census of electrical industries, which includes telephones, has been taken. The development of the industry, therefore, is shown from its infancy.

Cecil W. MacKenzie.

A TELEPHONE PIONEER.

The probability of a 1920 convention of the Telephone Pioneers of America calls attention to the fact that the number of those now living who were engaged in the telephone business at the time the telephone was first introduced—1875-1880 is not large.

One prominent member of the pioneers, who entered the service in 1879, and who is still actively engaged in telephone work, is Cecil W. MacKenzie of Buffalo, N. Y. Mr. MacKenzie, in addition to being a pioneer, is also somewhat of a historian. He has just completed writing a "Retrospect of Forty Years With the Bell System."

Mr. MacKenzie, when but fourteen years of age, happened to be one of the youths engaged in selling official catalogs at the Philadelphia Exposition, in the year 1876, at the time the Emperor Dom

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Pedro of Brazil "discovered" Alexander Graham Bell's telephone. Prior to that time Bell had not attracted much notice in his efforts to present his invention, but the intense interest of the Brazilian Emperor in the wonderful device gave an impetus to the idea that brought immediate favorable results. On that occasion Mr. MacKenzie saw Mr. Bell and the late Sir William Thomson, later Lord Kelvin.

Evidently the telephone must have been the exhibit which impressed him most favorably, for, three years later—in 1879—while living in Buffalo, N. Y., Mr. MacKenzie procured a position there in the first telephone exchange. At that time the operators were boys. Although the telephone business did not at that time hold out much inducement, Mr. MacKenzie remained in the service and, in 1883, was made chief inspector; or, at the head of what today is called the plant department. In 1901 he was advanced to the position of foreman of equipment, which position he held until shortly after the New York Telephone Company took over the Buffalo system.

In 1911, he was transferred to a position in the right-of-way department, where he is still employed rounding out forty-one years of continuous service in the Bell system.

Mr. MacKenzie is a regular attendant at the periodical gatherings of the Telephone Pioneers, and his clear recollections of the many changes that have taken place in telephone equipment and methods make him a fountain of information.

Mr. MacKenzie is a grandson of the Donald MacKenzie, who, in pre-confederation days, was Governor of a large section of northwestern Canada, with headquarters at Fort Garry, now the city of Winnipeg.

THE CABLE.

THE CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY has elected as directors: John W. Auchincloss, Edmund L. Baylies, R. Fulton Cutting, John J. Pierrepont, Percy R. Pyne, Charles Howland Russell and Cornelius Vanderbilt. These gentlemen also continue to serve as directors of the Mexican Telegraph Company.

E. V. JESSEN, representative of the Great Northern Telegraph Company of Copenhagen, Denmark, stationed at Nagasaki, Japan, recently passed through New York on his return to Nagasaki after a vacation spent in Europe. Mr. Jessen stated that during the war period Japanese male cable and telegraph operators became scarce on account of military needs, and that a successful attempt was made to train Japanese women operators. He said that the women learned to telegraph more quickly than their brothers. On account of the social conditions of the country, however, it was not permissible to work the girls later than 10 p. m.

OBITUARY.

Death of General Greeley.

Edwin S. Greeley, brigadier general in the Uni ted States army during the civil war, and who fo many years served as Chief Signal Officer of th Army, died at New Haven, Conn., on January 1(at the age of eighty-seven years. Four years ag General Greeley sustained injuries in a railroa wreck, from which he never fully recovered.

General Greeley was the founder of one of th first electrical supply houses in the United State known as E. S. Greeley and Company.

Since his retirement from the military servic General Greeley had been engaged in the bankin business and in other industrial enterprises. H was a past governor of the Sons of the Revolutio

EMMETT HOWARD, eighty years of age, formerl manager for the Western Union Telegraph Com pany at Memphis, Tenn., died at Russellville, Ky on January 6. During the civil war Mr. Howar was employed as a telegrapher in the Confedera service and served with distinction the cause he su ported. In the early days of Thomas A. Edison telegraph career Mr. Howard and Mr. Edisc worked together as operators in the Memphis offic

Telegraph and Telephone Life Insurance Association.

Assessments 667 and 668, dated January 1, 192 have been issued covering the deaths of Frank I Nichols, John P. J. McCarthy, Daniel J. Purdy, W liam J. Lenz, Henry T. Virts and Joseph Wert.

The number of members in good standing on D cember 31, 1919 were 2,707 class A, 543 class 287 class C, and 128 class D, in the first division. the second division there were 385 class A, 176 cla B, 114 class C and 84 class D.

New Book on Radio Telegraphy.

"Principles of Radio Telegraphy," is the name a new book by C. M. Jansky, which covers the lat practice in radio engineering. The book contai 237 pages and has 179 illustrations.

The first four chapters deal with elementary el trical engineering as applied to radio work, and t remaining seven chapters go thoroughly into t subjects of electromagnetic waves, alternating c rents, oscillatory circuits, radio circuits, practi transmitting appliances and methods, practical ceiving appliances and methods, and vacuum tul and their use in wireless telegraphy.

We recommend this fine work to all who a studying or who intend taking up the study of ra signaling.

The price of the book is $2.50 and copies may purchased from TELEGRAPH AND TELEPHONE A 253 Broadway, New York.

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International Communications Conference.

House Bill No. 9822, was passed in Washington on December 8, last, authorizing the President of the United States to arrange for and participate in an international communications conference.

There is undoubtedly a great need for an international conference on the subject of electrical communication. Experience during the late war focused attention upon many inadequacies of present international agreement relating to submarine cable and radio telegraph signaling.

The old cable treaties of 1884, 1885 and 1886, with other nations, are vague and unsatisfactory in their provisions, and in view of the present status of the art of electric communication are of little practical value.

From the standpoint of extending the investment of private capital in submarine cables the proposed conference should bring forth a clear understanding in regard to property rights so that in event of war communication facilities will not have the status of a torpedo boat or a battery of howitzers.

There is a host of questions relating to peace time interchange of traffic which are in great need of overhauling. One of these is the requirement of foreign government telegraph departments that on transferring a "reply paid" telegram to the foreign telegraph system, the cable company must pay over to the foreign system the amount of money prepaid for the reply, whether a reply is received or not. The present custom is for the foreign telegraph departments to deliver with the received message an order entitling the recipient of the message "to send a message, within the limits of the prepaid amount, to any part of the world." This order is good for six weeks from the date of issue.

It is probable that there is not another regulation in all commercial interchange which accomplishes more in the way of limiting traffic than does this arbitrary and unbusinesslike requirement. Managers of American telegraph offices are almost daily involved in situations where they must attempt to explain to patrons that although no answer has been received to cablegrams no refund of the cost of the reply can be made until the expiration of six weeks, and often at the end of the six weeks the manager is not in a position to know where he is to obtain reimbursement should he make a refund.

There are, however, broader matters than this which need attention. The certain increase of commerce between the United States and South American countries, and the growing commerce on the Pacific, will have to be served by cable and radio facilities equal to the requirements. The national and commercial importance of the business of this country makes it imperative that our needs must not be sacrificed in the interest of the needs of other countries, and the one way in which our interests may best be served is by the appointment as representatives at the conference of telegraph and cable executives of long experience. Also, delegates representing trade and manufacture should be large users of communication facilities, and if government, naval, or military delegates are named they should not be of the bureaucratic type, so often assigned to such work, which has in view mainly a sort of Wilhelmstrasse domination of the business agencies of the country.

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A SYSTEM FOR THE RECEPTION OF CONTINUOUS WAVES

By Lieut. John Scott-Taggart, M. C.

(Abstract from paper read before the Wireless Society of London.)

The arrangement to be described is of interest largely because it solves in one way the problem of producing a continuous-wave wireless receiving circuit capable of "stand-by" and "tuned" adjustment combining ease of manipulation and high selectivity. In addition, the circuits may be adjusted so as to reduce radiation to a negligible value. The complete arrangement was designed by the author and used for certain special artillery communications during the fighting of 1917 and 1918. As evidenced by reports it proved of exceptional value in battle, and overcame the difficulty, previously experienced, of interference by neighboring "spark" citations. On several occasions communication was steadily maintained with a forward station 15 km. away, although a 2-kw, spark set was operating within 300 yards of the continuous-wave receiving station and working on a wavelength only slightly different.

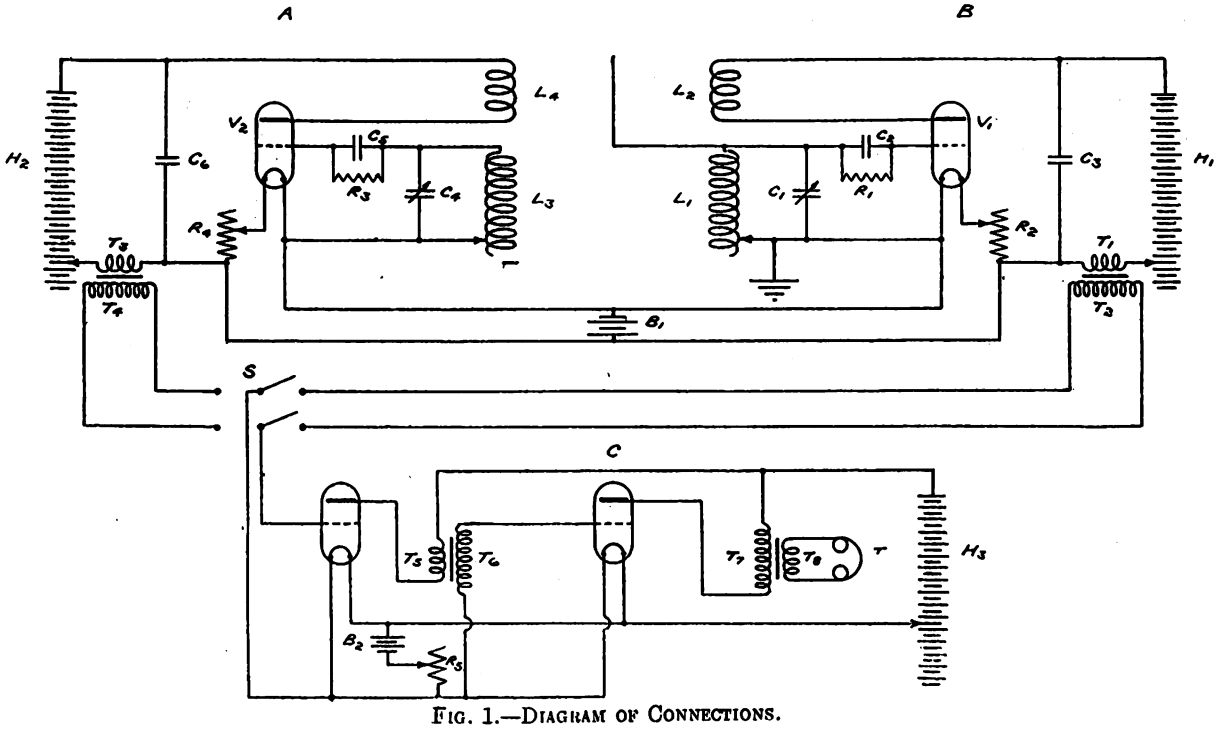

Fig. 1.—Diagram of Connections.

The arrangement may be divided into three essential circuits A, B, and C, Fig. 1. The circuit B is of the usual type. An aperiodic retroactor coil L_2 is coupled to a variable inductance L_1; this coupling is made variable, and if sufficiently tight will cause the circuit B to oscillate of its own accord at a freqency determined chiefly by the value of the condenser C_1. The filament of the vacuum tube V_1 is heated by a six-volt accumulator B_1 through a rheostat R_2 of about five ohms resistance. A plate battery H_1 of about 60 volts and the primary T_1 of a step-up transformer T_1 T_2 are connected as shown, a fixed condenser C_2, of about 0.008 mfd. being connected across H_1, and T_1 in order to by-pass the high-frequency component of the plate current of V_1.

The portion A is exactly the same as B except that no aerial or earth connection is made. The filament of V_2 is heated by current from the common accumulator B_1. A double change-over switch S enables any low-frequency current supplied by T_4 or T_2 to be applied to an audio-frequency or note amplifier C. This circuit C possesses an inter-valve step-up transformer T_5 T_6, a telephone step-down transformer TS TS, a pair of

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low-resistance telephones T, a plate battery H_3 of 60 volts, a filament-heating accumulator B_2 and other features which will be understood by reference to the figure.

The circuit A is placed near the circuit B so that an inductive effect is obtained. The distance between A and B should preferably be variable, and for eliminating interference the author has placed A as much as six feet away from B, although one to two feet is more usual.

While "listening-in," the switch S is placed over to the right, and all reception is accomplished by means of the B circuit. The coupling between L_2 and L_1 is adjusted until the circuits commence to oscillate of their own accord. By adjusting C_1 the tuning of the aerial circuit and the adjustment of the local frequency are accomplished simultaneously, and signals from an external C. W. transmitting station are easily picked up. It is to be noted that signals will only be heard if the local frequency is either greater or less than the incoming frequency by between 100 and 4,000. Beyond these limits the beats produced will, for all practical purposes, be inaudible. By gradually increasing the capacity of C_1 continuous-wave signals are first heard in T as a high note, which will gradually decrease as the capacity of C_1 is increased. A silent point will ultimately be reached, and under these conditions the local frequency will equal the incoming frequency. The aerial circuit will not be exactly tuned to the incoming frequency. As the value of C_1 is increased still further, beats will once more be formed, and a note will be heard which will gradually increase in pitch as the capacity of C_1 is increased, until it passes the audible-limit.

The signal strength obtained on this circuit B will depend to a certain extent on the value of the coupling between L_2 and L_1, the plate voltage, and the filament current. The cumulative method of grid rectification is employed, a grid condenser C_2 of about 0.0003 mfd. being shunted by a resistance R_1 of about 3 megohms. Apart from the correct choice of a suitable operating point on the grid and plate current curves, we are also concerned with the correct adjustment of the amplitude of the local heterodyning oscillations. This adjustment cannot conveniently be made, a disadvantage which is keenly felt.

It will be seen that for a beat note to be produced, the aerial circuit must be slightly mistuned, in order to produce local oscillation of a frequency differing from the incoming frequency. The incoming waves force themselves into the aerial circuit in spite of the fact that the latter is out of resonance. While preserving their original frequency the oscillations have their amplitude decreased, and cause a loss in signal strength which is very noticeable in the case of weak signals. The higher beat notes correspond to greater disparities between the local and incoming frequencies. Consequently, a high beat note necessitates a very considerable mistuning of the aerial circuit, especially in the case of wave-lengths higher than about 500 metres. This fact explains why the loudest signals are invariably obtained on almost the lowest beat notes since under these conditions the loss of efficiency due to mistuning is at a minimum. If this secondary effect were absent, the loudest beat notes would, in the case of an average pair of telephones, have a frequency in the neighborhood of 1,000.

The advantage of rapid adjustment while making the arrangement suitable for "picking-up" signals renders it open to serious interference from spark stations. Another very important disadvantage is that the circuit radiates while receiving. The B circuit acts, in effect, as a small power transmitter which will cause incalculable interference with other continuous-wave receiving stations within a few miles radius. It is safe to say that in nine cases out of ten, the local oscillations are far stronger than necessary. Unfortunately, attempts to decrease the oscillating energy usually result in stopping the circuits oscillating or impairing the detector efficiency of the circuit.

The disadvantage of excessive jamming may very largely be overcome by tuning the oscillating B circuit to the silent point of signals, decreasing the coupling between L_2 and L_1 or decreasing the filament current of V_1, so as to prevent V_1 from oscillating, and then switching S over to the left and returning on the circuit A, which is made to oscillate. The complete arrangement now acts as if an aerial circuit were very loosely coupled to the oscillatory circuit L_3 C_4. The filament or plate voltage of V_1 may be dispensed with, and signals will still be heard if the circuit A is tuned to oscillate at a frequency slightly different to the incoming frequency. Owing to the very loose coupling between L_1 and L_3 spark signals suffer in amplitude to a much greater extent than continuous-wave signals which persist. Another advantage of the arrangement is that the energy radiated from the aerial is merely that induced by the circuit A, which is a negligible amount if the distance between A and B is considerable. The chief disadvantage of the arrangement lies in the fact that considerable inefficiency is caused by the impedance of the mistuned circuit L_3 C_4.

A further development which leads to much louder signals is to adjust the B circuit to the pre-oscillatory or subgenerative condition immediately preceding self-oscillation, by increasing the coupling of the retroactor coil L_2 or the magnitude of the filament current, of which the latter adjustment is preferable. The incoming continuous waves are now retroactively amplified, a phenomenon which has received scant attention as applied to continuous waves. Through the retroactive effect, which partakes of the nature of a negative resistance, the energy losses are decreased and the amplitude of incoming signals increases, much louder results being obtained in the telephones T.

The ratio between the amplitudes of local and incoming oscillations is of great importance, and

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its effect will be very noticeable on the circuit under discussion, which allows for considerable variations of the ratio.

Let us suppose that the amplitude of the local oscillations is L and that of the incoming signals is I. We will readily see that the amplitude of the beats will vary from a maximum of L + I to a minimum of the difference between L and I. Suppose that L is greater than I. Then the average beat current, when rectified, will be proportional to

$$[(L + I)-(L-I)]/2=I.$$

Consequently, we can say that when the local current is greater than the incoming current the signal strength will be proportional to the amplitude of the incoming signals. A near-by continuous-wave station would consequently drown a distant station. If, however, the amplitude of the local oscillations is made less than that of the incoming waves, the beat amplitude will vary from L+I to I—L. The average rectified current would therefore be

$$[(L + I)-(I-L)]2=L.$$

In other words, unless the local oscillations are weaker than the incoming signals, the signals strength is proportional to the amplitude of the local current. Consequently, a very high-power station would not give any louder signals than a weak distant station. This effect is decidedly useful sometimes to prevent excessive interference.

These theoretical observations are fully borne out in practice, and many interesting facts may be deduced from circuits of the type described here. To determine the frequency at which circuits A or B may be oscillating, it is useful to use one of the various types of heterodyning wave-meters which has been devised.—*Electrical Review, London.*

Western Telegraph Company's South American Extensions.

NEW CABLE LINES BEING LAID.

Sir J. Dension Pender, presiding at the meeting of December 15, last, after referring to the increased revenue, said that although in the report £450,000 had been transferred to the general reserve fund, it had been debited with £600,000 being part of the cost of the manufacture and installation of new cables. That £600,000 was only a portion of the amount involved by their programme. Since the last meeting they had made an agreement with the Western Union Cable Company whereby that company would join the Western Company's new cable from Brazil at the Island of Barbados with a cable from Florida, thus forming the shortest and most direct communication between the River Platte, Brazil, and the United States. These cables would be of sufficient power, and be equipped with a system of working to enable these two companies to deal with even a far larger volume of traffic than was contemplated to develop for some considerable time, thus providing the nations of South and North America with a service which had become a commercial necessity in these times. The new cable between the Island of Ascension and Rio de Janeiro was successfully laid in September last, and had somewhat relieved the difficulties experienced through the interruption of the original cable to Brazil, nearly two and one-half years ago. It was impossible to arrange the manufacture of the necessary cable to lay the new and to repair the old line, and the former was considered of much greater importance, and therefore was carried out first. They had put on order 1,000 nautical miles of cable to renew partially this old line, but would not be able to obtain delivery and charter a suitable vessel to carry out the work until later, the demand for cables elsewhere being now so great. The threatened competition would come into force within the next few months, when rival cables would be laid by the Central and South America Telegraph Company between Rio de Janeiro and Santos and Uruguay. Before the war they had just commenced to renew certain of the original cables along the Brazilian coast. This policy had necessarily been suspended for the last five years, as owing to the difficulty in acquiring cable, and the great risk of transport, which was also most difficult to secure it was absolutely essential to conserve their stock of cable at the foreign stations. These renewals were now more necessary than ever and would be effected as soon as circumstances permitted by their own cable ships stationed on the coast. The company was the holder of all the preference shares and 93 per cent. of the ordinary shares of the West Coast of America Company which owned a single line of cables along the Chilean and Peruvian coasts as far as Lima and which company was connected to their system on the East Coast by land lines over the Andes from Valparaiso to Buenos Aires. Although the total cable capacity of that company and the Western Company's competitors, the Central and South American Company on that coast was ample for all requirements, the competition was such that he must foreshadow the necessity in the interests of the West Coast Company and the Western Company of considerable expenditure, not only in strengthening the existing communications but in extending the cables farther north. A further £1,500,000 would be expended in the near future, apart from the cost of extensions on the Chilean and Peruvian coasts. The original cable had been submerged for many years, and it was certain that heavy renewals would have to be effected sooner or later.

LONDON-PARIS telephone service was opened for public use in the year 1891.

THE first Edison electric light station in the United States was placed in service at Appleton, Wis., August 15, 1882. Water power was used to drive the dynamo. The first generator installed ser seventeen years' service.

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AN IMPROVED QUADRUPLEX SYSTEM

NEW WIRING ARRANGEMENT MAKES CIRCUITS WORKABLE

In both railroad and commercial telegraph service, Morse quadruplex operation at one time was quite general, but with the advent of the semi-automatic transmitter, as used by operators, the neutral, or common side of the quadruplex became a very unreliable channel.

In recent years several different arrangements of quad terminal wiring have been developed and placed in service. In addition to the standard Western Union quadruplex, and the Davis-Eaves quadruplex system used by the Postal Telegraph-Cable Company, various other circuit arrangements have been used. On railroad lines, where telegraph and telephone circuits are associated on the same physical lines the Gosselin quadruplex has been used to some extent. On some western railroads this system has been found to meet the new conditions very well, but in the east it has not been so successful.

On long lines traversing what some years ago was termed "the arid west" the quadruplex in al-

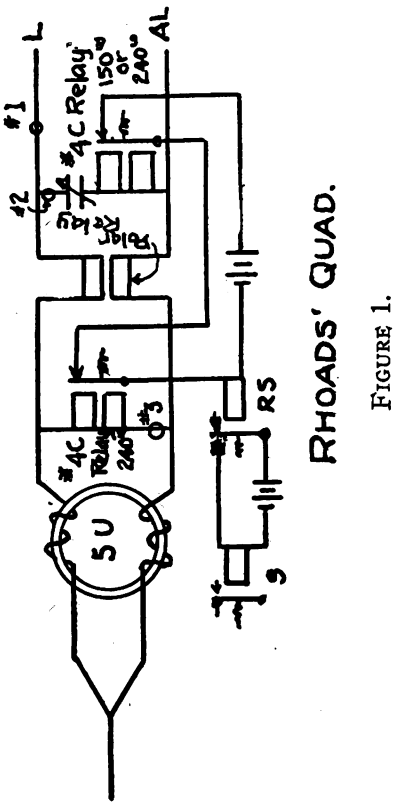

FIGURE 1.

most any form has been used with better success than on lines east of Chicago. There are many reasons for this situation—reasons well enough known to warrant omitting reference to them here.

The fact that quadruplex operation on lines east of Chicago has been so largely displaced within recent years does not mean that the additional channel on Morse wires is no longer in demand. Indeed there is a present necessity to secure all possible channels from existing wires as the telegraph traffic between terminal offices is naturally increasing in proportion to the increase in railroad traffic, and although much desirable economy is being effected by the use of cipher codes, and by eliminating unnecessary telegraphing, it is still true that the telegraph facilities of a railroad are of the greatest importance and value to the company in the operation and management of the business. There is a point in wire economy beyond which retrenchment cannot go without detriment to the business of the railroad, and while that point is not always identifiable to the satisfaction of everyone concerned, it is a fact that on many roads the present wire plants are loaded to capacity with telegraph traffic that it does not seem possible to curtail further without a reduction in the general efficiency of operation of the road.

During the past year the telegraph engineers of the New York Central Railroad have conducted a series of tests and experiments having in view improvement of the quadruplex. Oscillograph records have been made of the current conditions in quad circuits and from these it was determined that the common side line-relay in its usual position in the circuit, and equipped as it is with a sluggish armature, is too slow for semi-automatic machine transmission. Also it was shown that with the line connected to quad sets at each end the presence of the common side relays resulted in the polar side being much less efficient than if the line were connected to simple duplex apparatus at each end.

Experiment showed that an advantage is gained by placing the polar relay directly in the main line and the neutral, or common, relay in the bridge circuit. With this arrangement, and using an ordinary neutral relay an improvement was noticeable over the bridge quad polar side, while the neutral side remained as good if it was not better.

Further experiment showed that by replacing the standard neutral relay by a single line Morse relay of 240 ohms resistance (W. U. 4c relay) and by inserting a third relay (also a 240 ohm W. U. 4c type) in series with an adjustable condenser as shown in Fig. 1, the operation of the common side of the quadruplex is considerably improved.

With reference to the oscillograph records, the base line and trace marked No. 1, in both oscillograms are records of the current in the main line while the letter "a" is being repeated.

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In record No. 431 the distant end polar side key is being operated transmitting "a", while the remaining three keys of the quad are closed. Trace No. 2 in both records represents the current in the holding condenser circuit. Trace No. 3 is the current in the bridge arm in series with the 240 ohm common relay. In the diagrams the positions of the oscillograph recording elements are shown as No. 1, No. 2, and No. 3.

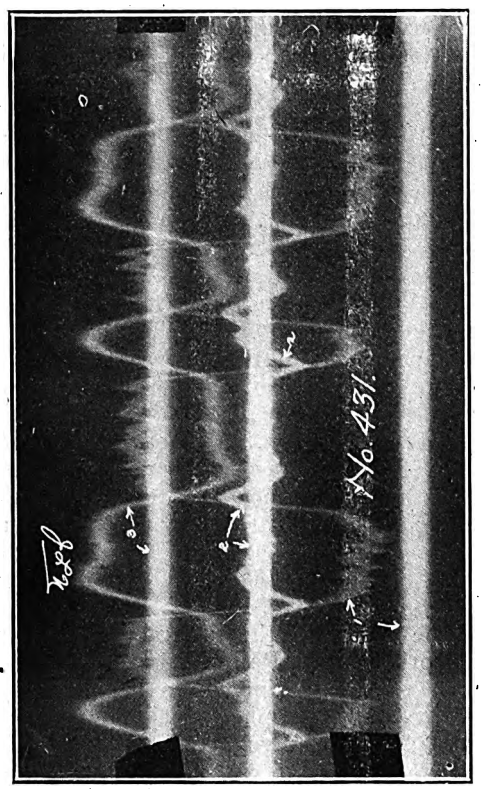

FIGURE 2.

Record No. 433 depicts the current conditions in these three places when the comon side key is transmitting continuously the letter "a" from the distant station. It may be observed that No. 2 trace indicates that the condenser charge is very light and has practically no effect upon the holding relay when the relay is properly adjusted.

In record No. 431 the condenser impulses appear much stronger and are therefore able to cause the armature of the holding relay to depart from its backstop at the instant the current is reversing in the neutral relay. During the reversal of current should the neutral relay armature be pulled into contact with its back stop, a false signal is prevented by the action of the holding relay in opening at that instant the sounder circuit.

In operation the current in the holding circuit—from the condenser—is always in a direction opposing the change of current in the line and artifical line coils of the relay, and the slight lag which this occasions favors the relay in the bridge circuit.

Record No. 431 indicates that the discharge of the condenser takes place at the proper instant in the reversal of current in the bridge arm, so that it tides over the interval of no magnetism in the cores of the common relay. The record shows an unexpected result in that it appears the condenser charge and discharge currents are confined entirely to the loop circuit consisting of the condenser, holding

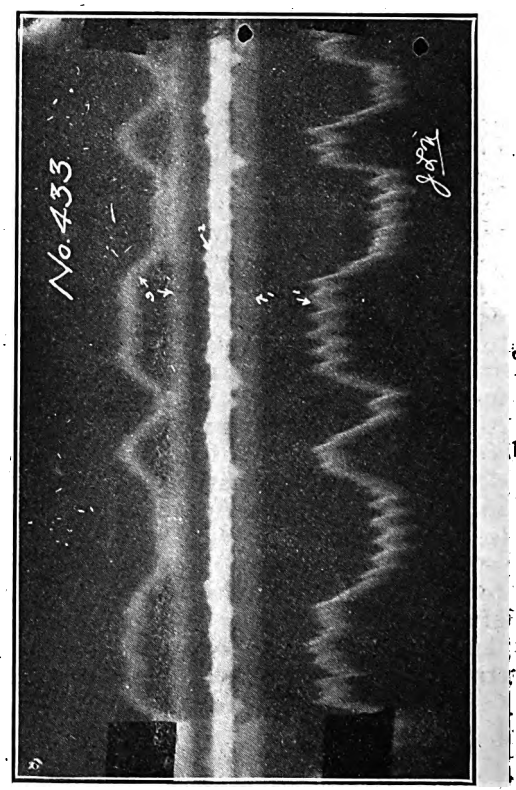

FIGURE 3.

coil, line and artifical line coils of the polar relay and the common relay. None of this current appears in the traces which record the current waves in the sides of the 5-u coil, nor in the line or artificial line at points where the condenser connects with the main and artificial lines.

A number of quadruplex circuits connected as shown in Fig. 1 are now in use on lines of the New York Central Railroad, Big Four Railroad and Michigan Central Railroad.

Electrical Measurements and Meter Testing.

This is a plainly written book, by D. P. Moreton. The book is particularly valuable to the telegraph and telephone engineers, because it deals directly with the subjects with which they are particularly interested. The voltmeter and the ammeter are the instruments used in this line of work, and these are to be found in all modern offices. Price, $1.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York

The Old Wire Chief says: "Everyone, of course, has his failings or shortcomings, so-called, but I do not think it is of much advantage to a man to keep his failings constantly in mind. We do not make our living out of our failings."

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WIRELESS COMMUNICATION ON THE LACKAWANNA RAILROAD

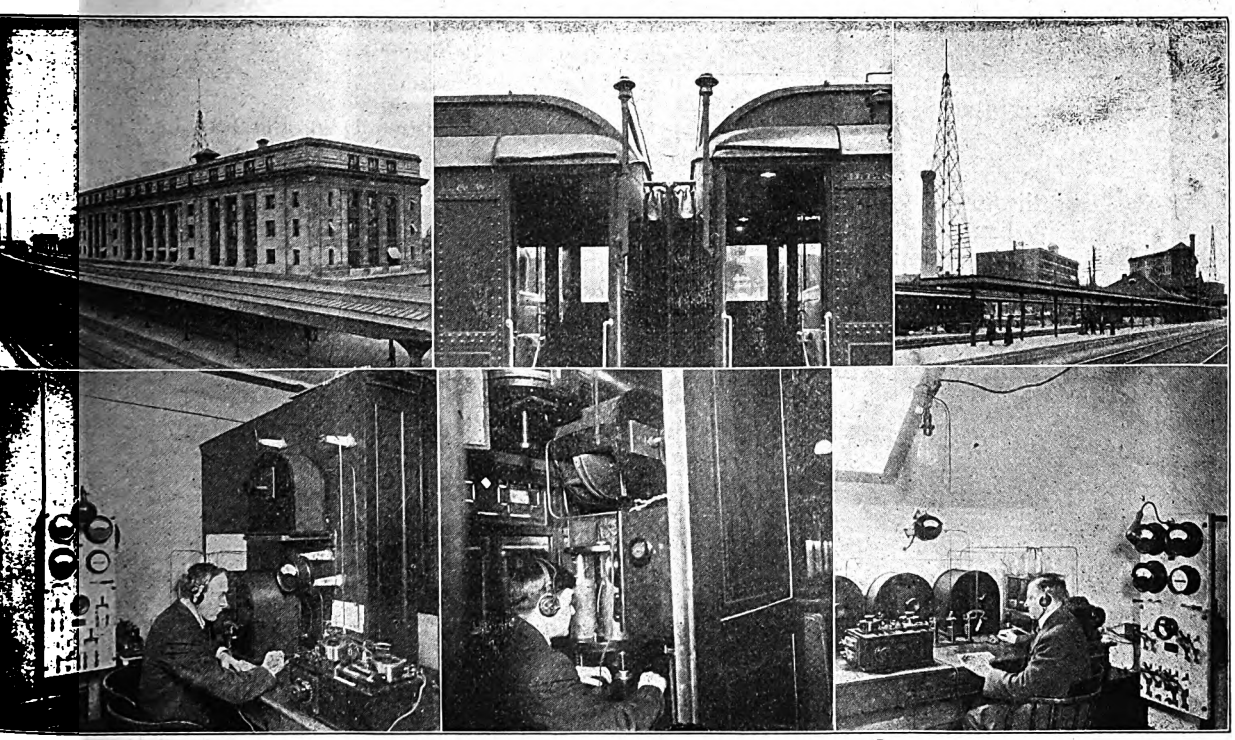
RADIO INSTALLATION TO BE RESTORED AS SOON AS THE RAILROAD LINES ARE RETURNED TO PRIVATE CONTROL

In the year 1913, the Lackawanna Railroad Company began the installation of radio telegraph and telephone apparatus for the purpose of establishing communication between terminal stations and moving trains and with the object of having at hand a means of communication between the main terminal stations at times when, due to storm or other causes, the regular wire lines might be out of commission.

On November 21 of that year the company, under the direction of L. B. Foley, superintendent of telegraphs, telephones and wireless, and J. J. Graff, telegraph engineer, tests were begun with apparatus which had been installed in the stations at Scranton, Pa., and Binghamton, N. Y., the stations having an operating radius of about 300 miles.

At the time the United States entered the war the company had made considerable progress in the new undertaking. Towers had been erected at Binghamton, Scranton and at Hoboken, N. J. Two fast trains had been equipped with antennas for the receipt and transmission of both telegraph and telephone messages, and the service had reached a point of reliability where a considerable volume of business was being satisfactorily handled.

Shortly thereafter the Government found it necessary, for war purposes, to prohibit all private use of wireless, and the Lackawanna towers were dismantled. In November 1919 the ban was lifted and the engineers once more took up the work where they had left off in 1916; but this time they had available to insure success a number of important improvements in radio signaling which had been developed during the war for military and naval purposes. These improvements, in part, consist of improved methods of telephone transmission employing vacuum tubes, and methods of amplifying weak signals at the receiving end to an extent that insures continuous service over all ordinary distances and regardless of varying atmospheric conditions.



SCRANTON PASSENGER STATION. SCRANTON OFFICE. | ANTENNA ON CARS. STATION ON TRAIN. | BINGHAMTON TOWER AND STATION. BINGHAMTON OFFICE.

FIG. 1.

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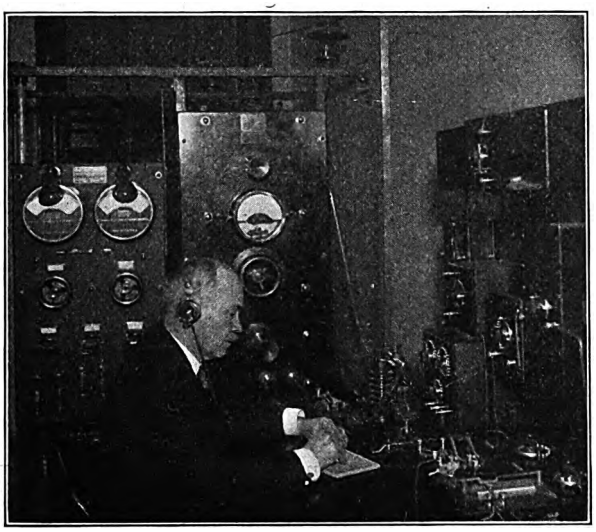
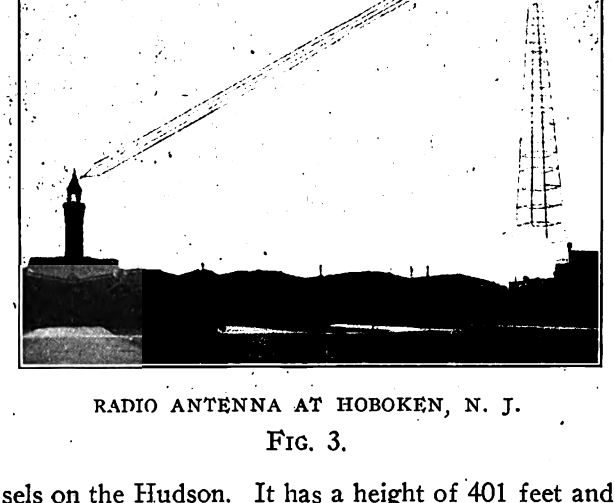
We present herewith illustrations of the Lackawanna radio installations at Scranton and Binghamton, including a view of the train antenna connection between cars of a passenger train and a radio office in a passenger car.



RADIO OPERATING ROOM AT HOBOKEN, N. J.

FIG. 2.

Fig. 2 shows the interior of the radio operating room of the Hoboken, N. J., terminal office, while Fig. 3 shows the tower and antenna at Hoboken. This tower is one of the most conspicuous objects on the New Jersey river front and attracts the attention of passengers on ferry boats and other ves-



RADIO ANTENNA AT HOBOKEN, N. J.

FIG. 3.

sels on the Hudson. It has a height of 401 feet and is quite simple in design as may be seen in the picture. The antenna extends from the top of the skeleton tower to the tower of the ferry house shown on the left (Fig. 3) the distance between the two points being 600 feet.

Unquestionably, wireless is likely to play an important part in intercommunication on railroad lines in the future, and the pioneer work already done by the telegraph department of the Lackawanna Company, and the further practical applications now about to be made will be of great value to the railroads of the country, and undoubtedly the same enthusiastic cooperation may be expected from the Radio Corporation of America (successors to the Marconi Wireless Telegraph Company of America) as was given in former tests and installations.

New Books.

"THE WIRELESS EXPERIMENTER'S MANUAL." By E. E. Bucher.

This is a new Marconi book, published January, 1920. This book is valuable both to the amateur and to the practical radio operator. It contains easily understood descriptions of radio transmitting and receiving sets of modern design, including radio telephony. The price is $1.75, from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

"RADIO ENGINEERING PRINCIPLES." By Lauer and Brown.

This is a January, 1920, book on radio, written by Henri Lauer and Harry L. Brown, radio engineers who were in charge of the preparation of training literature used in the United States Signal Corps during the late war. The work presents a thoroughly practical exposition of the principles underlying radio telegraphy and telephony. It is particularly complete in the treatment of the audion, or vacuum tube, in its application to radio signaling. The price of the book is $3.50, from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

"TELEGRAPHY, AERONAUTICS AND WAR." By Charles Bright.

This is a 400 page book, written during the year 1918, by Sir Charles Bright, the eminent British telegraph, cable and radio historian, and just received for distribution in America. The book is a product of the late war, inasmuch as it reviews in a thorough manner the accomplishments of electric signaling during the great conflict. The author also devotes many pages to a consideration of Imperial communication as a vital need of the British Empire. The book is for sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, at $6.00 per copy.

The Old Wire Chief says: "I believe that no good man thinks he has in him the chief elements of greatness or that he himself has accomplished any great thing. When, therefore, one such has unusual honors bestowed upon him or finds himself ranked with others whom he has considered great, neither the fact nor the form of such recognition will in anywise affect this own estimate of his powers."

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THE MORKRUM PRINTING TELEGRAPH SYSTEM

FULL DESCRIPTION OF OPERATION

Seventh Article.

(Continued from January 16 issue.)

Printing a Letter.—Let us assume that certain ones of the five selecting magnets have been operated. When the brush reaches the sixth segment, battery will flow from the brush to the magnet of the sixth pulse relay, operating the relay. The front contact of the sixth pulse relay is connected to battery through the tongue and contact of the main break relay and the contacts of the mechanical main break. When the sixth pulse relay operates its tongue will touch the front contact and battery will flow through its own coil, holding it operated. Battery will flow also from the tongue to the drum magnet, which is energized and moves the selector drum against the interference plates, stop pins passing through the plates where holes are lined up.

Battery from the tongue of the sixth pulse relay will also flow to both tongues of the print relay. The left hand back contact of the print relay is connected to the fourth pulse contacts and to the drum switch. If the fourth pulse contacts have been closed by the operation of the fourth selecting magnet, the fourth pulse relay will now operate. The closing of the drum switch, which takes place every time the selector drum operates, connects battery to the reset solenoid, which operates and resets the trip rods into engagement with their triggers.

At the same time that battery was connected to the drum magnet, it was also connected to one of the rotator magnets through the right hand tongue and the corresponding back or front contact of the fourth pulse relay. However, the rotator magnet thus energized could not rotate the typewheel, because it was held in locked position until the selector drum had completed its travel, unlocking it, and permitting rotation until the index arm struck a stop pin.

The operation of the reset solenoid closes the reset contacts which receive battery from the tongue of the sixth pulse relay. This battery flows through the reset contacts to the coil of the print relay causing it to operate. When the left hand tongue leaves its back contact, it cuts the battery off the reset magnet and the fourth pulse contacts. When the left hand tongue touches its front contact it connects battery to the striker and spacer magnets in series. This circuit to the striker magnet passes through the left hand tongue and back contact of the cut-out relay.

When the right hand tongue of the print relay touches its front contact battery flows into the coil, holding the relay operated until printing is completed.

The operation of the striker magnet throws the typewheel against the platen, printing the letter, and at the same time a lever on the striker shaft strikes the mechanical main break armature opening the main break contacts and thus cutting off the battery to the relays and magnets of the printer.

Function Operation.—Had the particular setting of the selecting magnets corresponded to a function, such as line feed, instead of a letter, the operation of the printer would be as follows: The sixth pulse relay would operate, and connect battery, as before, to the drum magnet. When the selector drum moved forward, the line feed function contacts would close and battery would flow from the left hand tongue of the fourth pulse relay, through its back contact and through the left hand winding of the cut-out relay to the line feed function contacts. From there it would flow through the line feed magnet, operating it.

The battery to the line feed magnet, passing through the cut-out relay, would operate this relay and battery from its right hand tongue would flow through its front contact to the main break relay. The operation of the main break relay would cut off all battery to the relays and magnets of the printer, restoring them to normal.

When the reset contacts closed, the print relay operated, cutting the battery off the reset magnet, but the striker magnet could not operate, because the circuit from the left hand front contact of the print relay to the striker magnet was opened by the operation of the cut-out relay.

Had the function selected been carriage return, instead of line feed, the operation would have been similar, except the fourth pulse of the carriage return signal being marking, the fourth pulse relay would operate. In this case the battery from the left hand tongue of the fourth pulse relay would flow through its front contact and the right hand winding of the cut-out relay to the carriage return function contacts. These contacts being closed the battery would then flow to the carriage return magnet. The operation of the main break relay would be the same as before.

The typewheel rotates on all functions, but cannot strike because the circuit to the striker magnet, which passes through the left hand tongue and back contact of the cut-out relay, is opened by the

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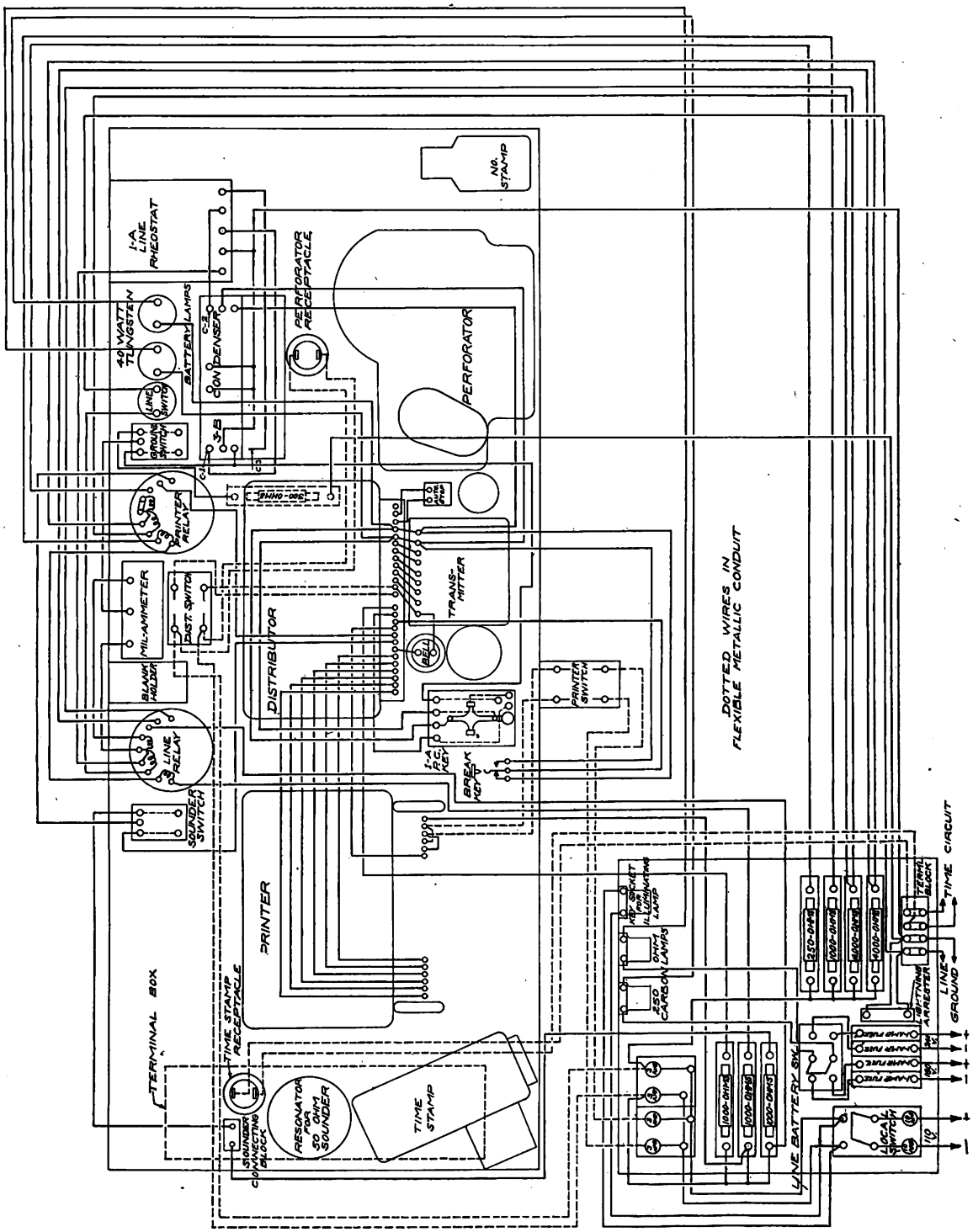

FIGURE 42.

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operation of this relay, which takes place on all functions.

Succession of Operations.—In Figure 42, the positions of the various relays and magnets indicate the sequence in which they operate. The order in which the operations, involved in printing a letter, take place is as follows:

1. Setting of certain interference plates by the operation of the corresponding selecting magnets. Their operation also closes the sixth pulse contacts.
2. Operation of the sixth pulse relay which locks itself in and supplies current to the fourth pulse contacts. If these contacts have been closed, the fourth pulse relay operates.
3. Operation of the drum magnet. Though the drum magnet receives current at the same time as the fourth pulse relay, the relay acts more quickly.
4. Operation of the reset magnet. When the selector drum moves a short distance, the drum switch closes and connects battery to the reset magnet.
5. Rotation. When the selector drum completes its travel, it unlocks the rotating mechanism and one of the rotator magnets which has been receiving current from the fourth pulse relay rotates the typewheel.
6. Striking. As the reset magnet completes its travel, it closes the reset contacts which connect battery to the print relay. The operation of the print relay disconnects battery from the fourth pulse contacts and the reset magnet and connects battery to the striker and spacer magnet in series.
7. Restoring. When the typewheel strikes the platen, the lever attached to the striker shaft opens the main break contacts, restoring all operated relays and magnets to normal position.

In the case of a function, such as line feed or carriage return, the succession of operations would be the same except that when the selector drum had nearly completed its travel, the selected function contact would close and connect battery through one winding of the cut-out relay to the corresponding function magnet. The operation of the cut-out relay would open the circuit from the print relay to the striker magnet and connect battery to the main break relay. This would prevent the typewheel from striking and restore the printer by opening the main break relay contacts.

Fourth Pulse Relay.—It should be noted that the fourth pulse relay determines the direction of rotation of the typewheel as well as determining which set of function contacts receive current. Both tongues of the fourth pulse relay are connected to the tongue of the sixth pulse relay and receive battery whenever the sixth pulse relay operates. If the fourth pulse relay has been operated, due to the fourth interval of the signal being marking, this battery will flow through the front contacts to the left rotator and to the function contacts corresponding to carriage return, letters, figures and signal. If the fourth pulse relay is not operated, the battery from its tongues flows through the back contacts to the right rotator magnet and the function contacts corresponding to space and line feed. Of course, the path it takes after reaching the function contacts is determined by the setting of the interference plates of the drum which determines which, if any, of the function contacts shall close.

It should be noted that the operation of the fourth selecting magnet does not cause the operation of the fourth pulse relay immediately, but merely closes two contacts which complete a circuit from the tongue of the sixth pulse relay to the magnet of the fourth pulse relay. The circuit passes through the left hand tongue and back contact of the print relay. Therefore, the fourth pulse relay can only operate after the sixth pulse relay operates and before the print relay operates. This prevents the fourth pulse relay from operating during the printing of a letter.

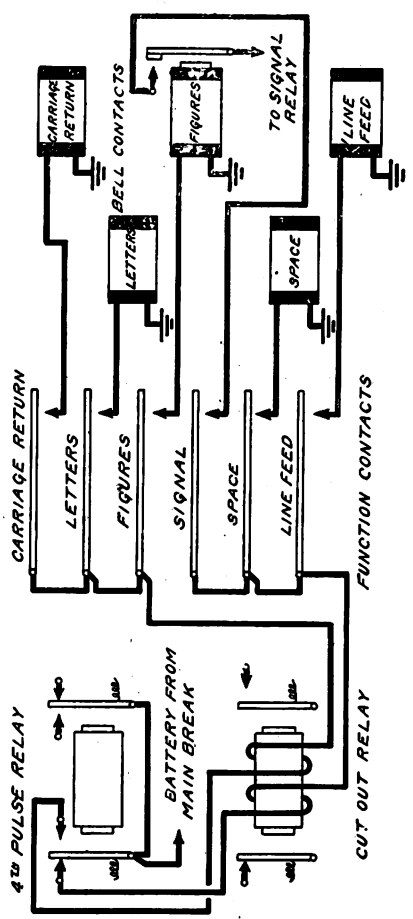

FIGURE 43. FUNCTION MAGNET CIRCUITS.

Both the fourth and sixth pulse relays have two windings. In the case of the fourth pulse the relay is operated through one winding and locks itself with a weaker current through the second winding. The sixth pulse relay is operated through one winding and locks itself with a weaker current through both windings in series.

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SUMMARY OF RELAY OPERATIONS

Fourth Pulse Relay—This relay, through its left hand tongue and contacts, determines which set of function contacts shall receive current. Through its right hand tongue and contacts, it determines which rotator magnet shall be operated.

Sixth Pulse Relay.—The front contact of this relay is connected to battery through the main breaks. To its tongue are connected the drum magnet, reset contacts and the tongues of the

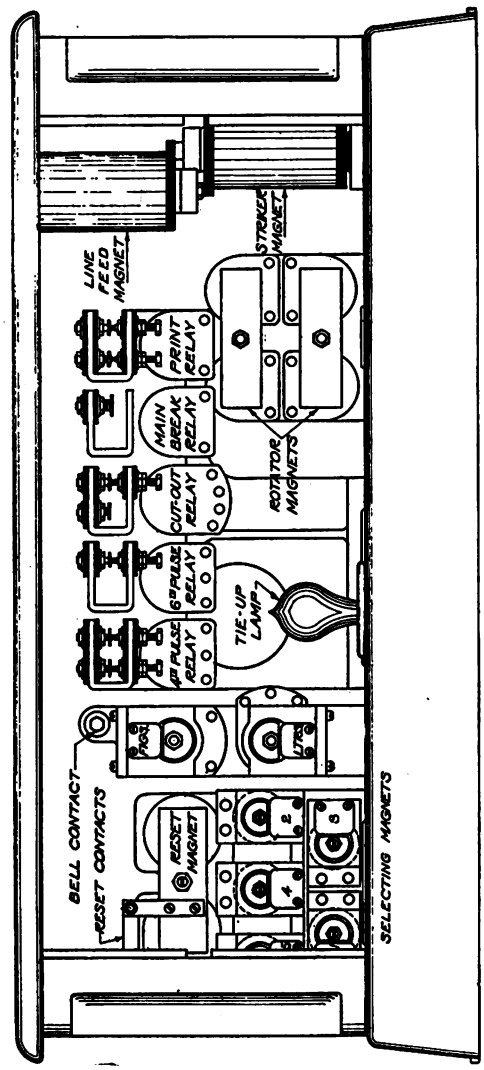

FIGURE 44. LOCATION OF RELAYS AND MAGNETS IN REAR OF PRINTER

fourth pulse and print relays. Thus, the sixth pulse relay must first operate to supply current to these and initiate the operation of the printer.

Cut-out Relay.—The left hand tongue and contact control the striker circuit, preventing the printer from striking on functions. The right hand tongue supplies current, through the front contact, to operate the main break relay and restore the printer after function operation.

Main Break Relay.—This relay operates only on functions to cut off the battery to all relays and magnets and restore them to normal.

Print Relay.—When its left hand tongue leaves the back contact, it cuts off the battery to the reset magnet and the fourth pulse contacts. When this tongue touches its front contact, it supplies battery to the striker and spacer magnets. The right hand tongue and front contact control the locking circuit of the relay.

Signal.—The function contacts marked signal are closed whenever the selection of the letter J is received. The circuit from the signal function contacts leads to a contact controlled by the figures magnet (Figure 38) so that if a figure signal is transmitted, followed by the signal for the letter J, battery will flow through the signal function contacts and to the contacts closed by the figures magnet to the bell, ringing the bell. The bell circuit is opened by the operation of the letters magnet.

Tie-Up Lamp.—As explained before, segments 1A, 2A, 3A and 4A of the receiving commutator are connected together and to the tie-up lamp in the printer. As the receiver brush passes over these segments, the lamp will receive current when the relay armature is against its marking contact and will receive no current when the relay armature is against its spacing contact. Thus when signals are being received which should operate the receiving printer, the lamp will flash. When no marking signals are being sent over the line, the lamp will not be affected.

The lamp is used as an indicator to guard against the loss of messages through signals being received when the printer is in a "tied-up" condition, due to the failure of a relay to operate or an open circuit. The lamp should flash while the printer is operating and should not flash while the printer is not operating. Therefore, if the lamp flashes and the printer does not operate it is an indication that the printer is "tied-up."

(*To be continued.*)

THE OLD WIRE CHIEF says: "It is not that other people often deliberately block or oppose our individual plans for personal advancement; but, rather, that our plans and the plans of others in their own interests at some point foul each other. There is nothing unnatural in this experience. The weak brother is he who gives up when he encounters this opposition. The domineering individual is he who ruthlessly overrides all opposing plans. The man who succeeds in this world without abandoning all thought of a seat in Heaven is he who modifies his plans so they will succeed without disrupting the honest plans of other people."

H. P. WAGNER of the American Telephone and Telegraph Company, Chicago, Ill., in remitting to cover his renewal of subscription for another year, writes: "The AGE is the only thing I buy that still sells at the same old price."

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INSULATING MATERIALS

PROPERTIES AND USES OF WIDELY USED ELECTRIC INSULATORS

ELECTROSE.

About eighteen years ago there was developed and placed on the market a form of composite insulation possessing many unusual characteristics. Although the material was non-fireproof, yet it was found to be well adapted to high voltage work and capable of withstanding arcing without destruction. Beginning in the year 1902, the material was employed for high tension line insulators on the circuits of the Niagara Falls Power Company and the Canadian Niagara Power Company. It is claimed that although lightning has frequently caused arcs to form around the insulators, not one unit has been damaged by lightning. This result is attributed to the inherent flexibility of the material, which permits it to withstand heat expansion strains which would rupture glass or porcelain.

This material, which is known as electrose, possesses hardness and toughness without brittleness; great strength, a smooth polished surface, and is water, moisture and oil proof. It will not shrink, warp, or change its form under ordinary conditions.

The making of an insulator may seem a very simple thing, involving merely the quantity of insulating material placed between the conductor and the support. That was the first idea, but it was soon found that insulators exposed to the weather accumulated impurities, dust and the like, so that when they became wet, they offered a path—more or less imperfect, but nevertheless a path—for leakage of electricity. Then more attention was paid to the shape of the insulator. It was formed with a number of petticoats so as to increase the under surface on which dust and rain would not be liable to collect. With increase of voltage the insulators became larger and larger and the petticoats more numerous until finally they became so cumbersome as to present serious mechanical difficulties in their construction and in the maintenance of the poles upon which they were mounted.

The use of higher voltages also developed other weaknesses. Glass was found too brittle and liable to break with variation of temperature. Furthermore, it was easily wetted, so that in rainy weather a film of water would form upon it. Porcelain was substituted for glass and found better in many particulars, but its chief insulating quality lies in the surface glaze. When this is cracked—and it is liable to be cracked by action of the weather—moisture entering the cracks will expand when frozen and rupture the insulator resulting in a short circuit. Unfortunately when a high-tension line is short circuited, surging is set up which is liable to rupture other insulators along the line. The effect is cumulative, so that serious damage may result from one defective insulator. A search was made for better insulating material, and a number of compounds have been discovered which show greater mechanical strength, which are unaffected by temperature changes and which, being of an oily nature, are not readily wetted with water; that is, the water collects in drops rather than in a film over their surface.

But the problem was more than one of material only. It was a mechanical problem. The pin type of insulator had been outgrown. The next development was to suspend the insulator from the cross-arm, instead of supporting it on a pin. Because a flexible support can be made much lighter than a rigid one, this reduced the weight on the cross-arm at once. The conducting wire could be supported at a greater distance from the cross-arm than was possible before. Furthermore, a chain of insulators could be used in place of a single, large, rigid insulator. This is the type of insulation now in common use on high-tension lines, the only objection being that the line is apt to sway in the wind and might come in contact with its support. This may be prevented by proper spacing and the use of lateral guy lines also made up of chains of insulators known as "strain" insulators. Still another method is to "dead end" the conductor at each pole by means of "strain" insulators, using short loops to carry the current past the cross-arm. Both the "suspension" and the "strain" types of insulators consist of disks formed with petticoats or flanges and furnished with hooks at each side, to permit of connecting any number together in a series long enough to provide the desired insulation. The series is often "graded" from a large insulator at the conductor to a small one at the support, thus reducing weight and at the same time increasing the insulating qualities of the series.

Electrose is a really remarkable compound and its uses in the electrical industries has been widely extended since its first use in the manufacture of high-tension insulators. Today, it is used in telegraph and telephone work in a variety of ways. Telephone receiver shells and caps, transmitter mouth-pieces, and cable terminal strips are made of electrose. In telegraph work key knobs, instrument bases, terminal bars, condenser cases, and many other insulating units are made of this material.

In radio telegraph work the uses to which electrose is put are many. In fact, it seems to meet the

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requirements in practically all equipment where insulating material is required.

FIBER.

There are several grades of insulating fiber used in electrical work. The material is mainly composed of wood fiber which, treated by certain chemical agents, dissolves and is solidified by drying after being submitted to a very high mechanical pressure. The manufacture of insulating fiber requires the right kind of wood, very accurate workmanship in making the paste, in drying and in compression.

A high grade of this material, known as vulcanized fiber, is tough, strong, easily drilled or formed, and can stand exposure without disintegrating. At the same time, unlike glass or porcelain, it is slightly elastic and it is not brittle. Such a substance has a large scope of application in the electrical industries.

Vulcanized fiber is not waterproof. It absorbs water to a certain degree, but is not injured by either hot or cold water, for it returns to its original dimensions and properties when dried. Most dilute acids and akalies cause no other effect than the effect of water, but concentrated acids cause disintegration. However, organic solvents and all oils have absolutely no effect and are not absorbed in the slightest degree.

GENERAL USES FOR ELECTRICAL INSULATION.

Although vulcanized fiber was first used in 1873 for axle washers and railway-car journal dust guards, it has been more widely known in late years as an electrical insulator. It was early used in large quantities for magnet bobbins, coil insulation, cleats, armature wedges, insulating blocks, gears and handles, etc. Since the development of the automobile industry another large electrical insulation field has been opened. It is of service for insulated staples and cleats, straight and bent wire conduits, flanged bushings for use wherever a wire passes through body or frame, timer rings and other insulating rings, insulating washers, switch bars and bases, switch panelboards, fuse tubes, and in general where good machining and bending qualities are a necessity.

One of the largest uses of vulcanized fiber at the present time, either for electrical or mechanical purposes, is for railway signal insulation. The specifications for this application are quite severe. This is an instance where the material is subject to severe weather conditions and extreme mechanical strain, and yet the dielectric strength must be high even when it contains a fairly high percentage of moisture.

BAKELITE PRODUCTS.

Another line of insulating products which has within recent years gained a wide market is that based on bakelite. These products are phenol-formaldehyde compounds. During the past eight years various grades of this insulating material have been placed on the market, one of which is known as bakelite-dilecto. This is a hard, strong insulating material made by hot pressing paper which has been saturated by raw bakelite. It is manufactured in the form of sheets, tubes and rods. This material is remarkable in that it combines in one material the good qualities of many materials with several useful properties which are essentially its own. It resists water and is about equal to hard rubber electrically without hard rubber's limitations of temperature and short life. It is harder and stronger than most woods, but does not swell or warp; also it is capable of being machined like metals.

Chemically, bakelite-dilecto is inert, insoluble and infusible. Strong concentrated acids such as nitric and sulphuric acids carbonize it, and strong hot caustic solutions attack it but it is not affected by weak acids or alkalies. The ordinary solvents such as alcohol, benzol, turpentine, acetone, hot water, etc., will not dissolve it. The material has a smooth, hard surface which will take a high polish when sanded and buffed.

New Western Union Telegraphic Code, Five-Letter Edition.

The New Western Union Telegraphic Code, Five-Letter Edition, has recently been placed on the market and the large sales of the book testify to its rapidly growing popularity. The business man needs this work, and when he sees it he instantly adopts it. The book contains 380,000 phrases, each phrase being represented by a five-letter word. These words are pronounceable singly or when two of them are joined together. The latter results in the saving of fifty per cent in cable tolls. The book weighs fifteen pounds, contains about 2,000 pages and measures thirteen inches in length by eleven inches wide, and is three and one-half inches thick. There is no waste space in the book. Every telegraph manager should call this book to the attention of his customers. The price is $30.00 per copy and it is on sale at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Book on Alternating Currents.

Arithmetic of Alternating Currents, is the name of a new book by E. H. Crapper. For those who are familiar with elementary mathematics, this book will be found valuable as it describes in a thorough manner periodic and alternating currents; generation of alternating electromotive forces; inductances; inductive circuits; capacity and condensers; resistance, inductance and capacity in parallel; static transformers; induction motors and transformation of currents.

The book contains 208 pages. Price $1.25. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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LINCOLN'S ADDRESS TO WORKMEN.

An interesting comment on the extract of Lincoln's speech to the Workmen's Association in 1864 that was printed in the December number of the Magazine has been made by F. P. VanAmburgh in his Magazine, *The Silent Partner*. It is as follows:

In a shaded spot near Springfield, Illinois, and at the foot of a wooded knoll, they laid the great Mediator of Men by the side of his little son.

Fifty-four years have come and gone, and now we Americans can see with clear vision the noble outlines of that Mediator's moral courage and his desperate struggles to save this Union—to save us from ourselves.

The wisdom of the Man's words, the vital importance of the Man's work are all so very clear to us now!

His lifelong fidelity to his own courageous convictions of right; his resolute rule to do right; his often thankless task of trying to teach our people that they could trust him; his public life of prayer for all of the people all of the time—this was the Man.

When they laid this Man to rest, the halls of Congress, the lobbies of hotels, stores, banks, stock exchanges and the mansions in marble were all draped in mourning; but, above and beyond all these tributes—the homes of the plain people were houses of real grief. Yes, the homes of the plain people, for Lincoln was a plain man.

Lincoln's most marked characteristic was his understanding of the people—and his understanding of himself.

And it is before the plain people (a class to which I belong) that we would spread an extract of Lincoln's Address to Workmen:

"'Property is the fruit of labor; property is desirable; is a positive good in the world. That some should be rich shows that others may become rich, and hence is just encouragement to industry and enterprise.

"Let not him who is houseless pull down the house of another, but let him work diligently and build one for himself, thus by example assuring that his own shall be safe from violence when built."

Could the mind of man put in plain language a greater truth than this: *"Thus by example assuring that his own shall be safe from violence when built?"*

Here, my fellow Americans, we have the sum total of all alien theories exploded by simple, practical common sense from the lips of Lincoln.

And it is worthy of note to record here that Lincoln was the first Presisdent to sentence to banishment a man who delivered violent speeches against this country.

When I hear the alien destroyer talk about the accumulation of property—that property is not the fruit of labor, but the spoils of a mob—my mind recalls the Farewell Address of Washington, the sturdy sayings of The Great American, Roosevelt, and down comes, from off the bookshelf, the Life of Lincoln, and I soon forget how lonely it must be for those poor deluded destroyers who are now sailing the sea under protest.

Down through the halls of Time, too, comes the ringing speech of Webster: *"God grants liberty only to those who love, and are always ready to guard and defend it."*

"THE AGE OF EDISON—73"

About a year ago Mr. T. G. Barker, of the Commercial Cable Company, New York, launched the idea of making February 11, 1920, a national "'Edison Day." Through the co-operation of T. C. Martin, secretary of the National Electric Light Association, the aid of that association and of electric light and other electrical industries in all parts of the country, has been enlisted.

On February 11, 1920, Mr. Edison will be seventy-three years of age, and in putting the subject forward, Mr. Barker says:

"'73,' as you know, is the telegraphic symbol, or sign, for a greeting, for 'warmest personal regards,'

THOMAS A. EDISON.

and for a general expression of good will. '73' flashed over the wire is evidence that both sender and recipient are good fellows. Written communications end with the cheery '73.'

"The general public, in another sense, in this particular instance, would quite readily understand '73,' or rather, 'EDISON—73.'

"Opporunity should be taken of this occasion to provide a country-wide display at the larger telegraph offices, electrical houses and plants, motion

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picture houses, and phonograph shops, of an illuminated sign:

EDISON—73

on February 11, next, in honor of the great inventor who gave us quadruplex telegraphy, the phonograph, the electric light and a long list of other inventions which in their modern applications constitute facilities and conveniences which we could not now get along without."

It may be that it is now a little late for telegraph people to undertake the arrangement of an adequate display of the beloved symbol; but it would be a fine tribute if on February 11 every one of the 80,000 telegraph operators in the country should at least once on that day send over his wire to the man he happens to be working with a telegraphic tribute to the great telegrapher, in the form, "Edison—73."

Adjustment of Semi-Automatic Morse Transmitters.

One of the important subjects taken up by Committee No. 6, Telegraph and Telephone Division. American Railroad Association, of which H. Hulatt is chairman, is that of proper adjustment of semi-automatic Morse transmitters.

At a future session of the Division it is the intention to submit an approved, uniform method of adjusting transmitters to meet conditions met with on various lengths of circuit.

In the service of one of the commercial telegraph companies it is the practice to so adjust transmitters that not more than eighteen letters "p" (five dots) can be sent in a period of ten seconds; each letter clearly and distinctly formed. This adjustment holds down the dot speed of the transmitters so that signals will carry over comparatively long circuits and through single line and multiplex repeaters satisfactorily.

A. Behner, telegraph and telephone engineer of the New York Central Railroad, has recently made tests with transmitters with the object of determining an adjustment of the vibrating member of the instrument which will provide a duration of contact insuring the transmission of clearly defined and definite signal impulses.

His conclusions are that the transmitter, before being placed in service, should be adjusted in a pony circuit with a milliammeter in series. With the transmitter in circuit its weights and spacing contacts should be so adjusted that the meter needle will vibrate at 50 per cent. of the steady, closed circuit current value; that is, it should have a 50 per cent. average value. His experiements show that proper adjustment of the contact spacings is of the greatest importance. The position of the lever weights was found to be of secondary importance.

This is a very important subject and one that is worthy of all the engineering attention that can be given it.

The Law of Delayed Telegrams.

On January 12, the United States Supreme Court decided that the State of Indiana statute penalizing telegraph companies for negligent delay in delivering telegrams is inoperative as to interstate business, owing to the federal act of 1910, placing telegraph companies under the jurisdiction of the Interstate Commerce Commission. The court reversed the Indiana Supreme Court decrees in judgments against the Western Union Telegraph Company for failure to deliver promptly a telegram sent from Chicago to Fort Wayne, Ind.

Letter Telegraph Service Proposed.

Representatives Bee, of Texas, and Kitchin, of North Carolina, have prepared bills for the House providing for letter telegraph service under the supervision of the Postmaster General, the rate not to exceed 30 cents per hundred words. Under the provisions of the proposed bills the Postmaster General would be authorized to negotiate contracts with the existing telegraph companies covering this service. Mr. Burleson is said to believe that a rate of 20 cents per hundred words might be obtained for this service. Representative Kitchin's bill was drawn as an amendment to the post office bill now pending before Congress.

Telegraph and Telephone Meeting.

On February 19, the afternoon session of the Midwinter Convention of the American Institute of Electrical Engineers is to be in charge of the Institute's Telegraphy and Telephony Committee. Two high grade technical papers are to be presented at this session; one on "Telephone Repeater Circuits," by Dr. G. A. Campbell, research engineer of the American Telephone and Telegraph Company, one on "Printing Telegraph Systems," by John H. Bell, telegraph engineer, Western Electric Company, New York.

This session will begin at 10 a. m., and all telegraph and telephone engineers who are in New York on February 19, whether members of the Institute or not, are invited to attend the meeting, which will be held in the Engineering Societies' Building, 29 West 39th Street.

American Telephone and Telegraph Company Earnings.

Net earnings of the American Telephone and Telegraph Company for the year ended December 31, 1919, according to the preliminary statement of earnings and expenses issued by the company January 14, amounted to $60,225,461. Dividends of $16,461,670 were set aside during the year. The balance available for reserves and surplus of the company was $9,021,531. For the fourth quarter of the year the company's net earnings were $16,743,824. The balance for that quarter available for reserves and surplus was $3,231,380.

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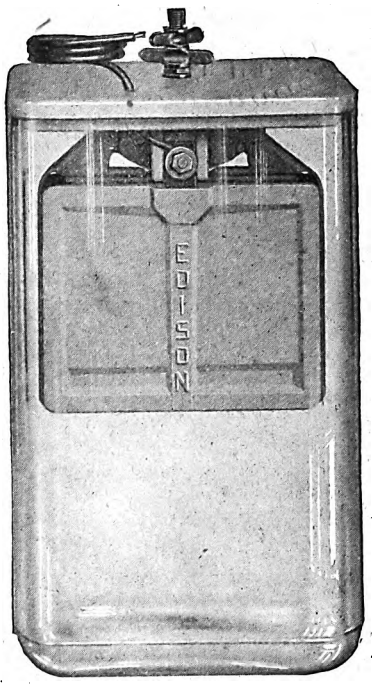

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THE RAILROAD TELEGRAPH AND TELEPHONE

H. HULATT, manager of telegraphs, Grand Trunk and Grand Trunk Pacific Railroads, was a New York business visitor on January 16.

Canadian National Railways, Eastern Lines.

A. C Barker, assistant to the general superintendent, with headquarters at Moncton, N. B., is also superintendent of telegraph and time service. D. A. MacNeill, at Moncton, is supervisor of telegraphs.

Superfluous Words in Railroad Telegrams.

E. C. Keenan, general superintendent of telegraph, Eastern Region, United States Railroad Administration, has issued a circular listing thirty typical sentences appearing in railroad service telegrams and which contain superfluous words. In a parallel column is given a list of phrases containing the same information, but with a reduction of about 60 per cent in the number of words used.

Code for Railroad Telegraph Uses.

The Grand Trunk Railway Company has been using the Dempsey telegraphic cipher code for more than a year, and recently placed an order for 600 additional copies of the code book; making a total of 2,100 copies in use on that railroad.

Effective Business-Getting Circulars.

The Grand Trunk Pacific Telegraph Company has issued for distribution through its office managers a very attractive circular outlining the various classes of telegraph service the company renders, including day messages, night messages, day lettergrams, night lettergrams, cables and marconigrams. Under the direction of H. Hulatt, manager of telegraphs, this company has built up a large telegraph traffic in North Western Canada, and the company's officials and office managers at all points have high standing with commercial interests in that territory.

O. F. CASSADAY, for several years past in charge of sales work throughout the middle west and southwest of telephone apparatus, lightning arresters and line construction specialties, has become general manager of the Gund Manufacturing Company of Lacrosse, Wis. Among the various specialties this company manufactures are a reliable, simple, inexpensive guy anchor and a really useful lamp cord adjuster.

Conserving Poles and Posts.

Timber suitable for telegraph and telephone poles, fence posts, etc., is becoming scarce and expensive. It is estimated by the Forest Service that sixty years hence will witness the practical extinction of such material.

At present about four million poles are being erected annually. Records compiled by the Forest Service show that 95 per cent. of all poles are destroyed by decay, 4 per cent. by insects and the remaining 1 per cent. by mechanical abrasion.

Scientists who have been giving the subject attention advise as a result of experiments conducted by them that creosote treatment applied to the ends of the poles and posts imbedded in the ground will lengthen the life of the poles as per the following tabulation:

White cedar	16	years (untreated)	to	30	years	(treated)
Cypress	6	"	"	15	"	"
Chestnut	12	"	"	16	"	"
Pine	6½	"	"	20	"	"
Juniper	8	"	"	18	"	"

There are three methods of treatment adaptable to the purpose: the open tank method whereby only the butts of the poles are treated; the pressure process, used only on short poles; and the brush method which may be applied in the field as the poles are being set. The employment of the open tank method calls for the application of the treatment before the poles are shipped on the job.

As creosote and the labor required to apply it are much cheaper than new timber, it is needless to say that railroad companies, telegraph and telephone companies, using large quantities of timber for poles and posts are giving this matter much serious consideration.

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QUESTIONS AND ANSWERS

Water.

W. L. T.—In storage battery practice, it is always recommended that soft, or rain water, be used in replenishing cells. The difference between hard and soft water is that hard water contains mineral matter, usually lime or magnesia in solution. Rain water is soft and free from mineral matter.

Artesian water is the same as any other well water. The name is derived from the Province of Artois, where water wells are numerous.

Water expands 10 per cent. on freezing.

Running water tends to purify itself. Rainwater gathers impurities while falling. If falling rain tends to clear the atmosphere, it follows that the rainwater must contain the impurities brought down.

Tungsten Lamp Resistance.

E. J. C.—With further reference to the information given in answers published in the December 1, and January 16 issues, in this department, regarding the resistance of the filament of tungsten lamps of various wattages: The figures given were the "hot" resistance values. With this information. and what follows, you should have all of the data you desire.

A tungsten lamp lights up more quickly after current is turned on than does a carbon filament lamp, because of the difference in the cold and hot resistances of the filaments. A section of tungsten wire having a resistance of one ohm at 0 degrees centigrade increases its resistance to seven ohms at 1,000 degrees centigrade. In the carbon lamp the resistance of the filament when cold is twice as great as when it is at an incandescent heat. Applying Ohm's law with these conditions in mind, remembering that the heating effect is proportional to the square of the current, it may be learned that the heat generated in a tungsten lamp when first lighted is high, while in a carbon filament it is correspondingly low at the instant current is turned on.

Radio Amateur Restrictions.

R. W. C.—The government order raising the amateur radio ban reads as follows:

"Effective October 1, 1919, all restrictions on amateurs and amateur radio stations are removed. This applies to amateur stations, technical and experimental stations and colleges, and to all other stations, except those used for the purpose of transmitting or receiving commercial traffic of any character, including the business of the owners of the stations.

"The restrictions on stations handling commercial traffic will be removed as soon as the President proclaims that a state of peace exists.

"Before operating transmitting stations it is necessary to take an examination and secure an operator's license and have on file with the district radio inspector a formal application for station license. The radio inspector can assign radio call letters when the application is received.

"All amateurs should be familiar with the Radio Laws and Regulations. This publication can be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 15 cents.

"All transmitting sets should be inductively coupled. Stations having what is known as plain aerial, or the spark gap directly in the antenna circuit, will not be licensed where they do not comply with regulations 3 and 4 of the Act of August 13, 1912."

Radio Wave-Meter.

G. M. C.—A wave-meter is a very desirable instrument to have on hand. Not only does it enable you to determine the wave length of transmitted waves, but it aids the student materially in understanding the principles of radio signaling. A thoroughly reliable wave-meter may now be purchased for the low sum of five dollars.

S. O. S!

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SHIRLEY M. ENGLISH.

BY M. B. WYRICK.

In a lonesome swamp in Arkansas on a dark night in the spring of 1896, the wire gangs had assembled and two 300 pound copper circuits had just been closed between Memphis and Pine Bluff for the Postal Telegraph Company of Texas. Extraordinary efforts had been made to close the circuits on this day as we were informed that it would be an event of more than passing importance to the officials who were located in Pine Bluff and required direct wire connection to the outside commercial world and home offices in Boston. The electric life had been felt in the wires all day by the construction men but there was no way of knowing whether they were clear and in working condition after the physical connection had been made.

I was detailed to go some distance to Rob Roy, an "O. S." station of the Southwestern Railroad, to borrow a relay which the night operator kindly loaned me from one of his Western Union sets. On returning, I climbed a pole, cut in on one of the circuits and called for "wire" in a very nervous, "Ham" fashion by tapping on one of the relay binding posts with the free end of a wire. Instantly there came an answer in an even, easily read, signaling which, in after years, I learned to distinguish among numerous rattling sounders (just as you learn to distinguish the voice of a friend in a crowd). I was curious to learn who was talking and after exchanging questions and answers concerning the business on which we were engaged, I asked who was talking as this signal, never to be forgotten, came through the dark with me ---·---·- (S. M. E.)

Such was my introduction to the man who later became my warmest friend and staunch supporter in all things: Mr. S. M. English. Early in the year (I have forgotten the date) he was appointed electrician for the Postal Telegraph Company of Texas. He had formerly been chief operator for the same company at New Orleans at which place he had risen from the ranks, beginning as messenger with the Western Union Telegraph Company to chief operator, when he was transferred to the Postal for similar position.

At the time I became acquainted with Mr. English, the heads of the organization were as follows: Clinton P. Russell, president and general manager, G. W. Foster, general superintendent, D. McReynolds, superintendent of construction, and S. M. English, electrician. I was soon detached from the construction department and assigned as installer with and under the direction of Mr. English. Together we installed all the offices and dynamo plants of the company. When the pioneer work was finished, Mr. English was assigned the duties of operating superintendent and soon after that became general superintendent and a few years later was promoted to general manager and then to president, which position he held until 1913 when he was made general manager of the Western Union Telegraph Company's Gulf Division which office he held at the time of his death.

Mr. English's success was due to an almost inexhaustible energy, an experimental mind, the possession of a normal imagination and a soul full of kindness and generosity, which attracted and held like a magnet, the confidence and love of all those with whom he became associated. He was a good judge of human nature and was not easily deceived. His watchword was service and he possessed the quality of inspiring this in his associates to the extent that he built up an organization that was zealous and loyal, and he maintained a service that was appreciated and patronized by the public in face of all opposition. To us "---·——-" meant the "Minute Man," ever alert and on the job in the interest of service and so it was throughout my many years of association with him. When service was interrupted and I would call in from the scene of wreck or flood, I would soon be encouraged by the answer "---·——-" and the practical suggestions he would give, as in the great disaster at Galveston, September 8, 1900, after being cut off from the outside world for many hours, when he finally got wire connection via New Orleans. it was "---·——-" that answered the moment our signal was made on the connected circuit. With his ever-ready consideration of difficult conditions, he informed us of the relief that was organized and enroute and he soon was at the front laboring among the dead and distressed in the wreckage. With his master mind and ability for handling details, he was able to supervise closely a service in operation as well as restore one interrupted—as demonstrated many times to the embarrassment of I. D. Hough and myself. When unable to locate a mysterious trouble we would plan to cut it out (contrary to the rules) and with Hough on the board, it would invariably be "---·——-" that would come to me over the wire when I cut in. Even though he was president and general manager, he did not forget nor neglect that which makes service.

During all the years of his untiring activities, Mr. English was a sufferer of acute indigestion, an attack of which finally carried him off. Many a night have I stayed with him until the small hours of the morning and if I retired for a short sleep I would find on awakening that he had not slept at all, and if the pain would subside, he would work throughout the day with apparently as much energy as though his condition had not been a critical one a few hours previously. I have known him to stand on the platform of a moving train, suffering so that it required all the will power of his pain-crazed brain to refrain from jumping off.

I had the good fortune to know Mr. English in his home and social life as intimately as in business. I know the concern with which he viewed the future when his six children were small and his salary likewise; how he worked, planned and saved in order to make the first payment on a home. In this he was ably assisted by the good, noble woman who is left with five of the children to bear the sorrows of his departure, as well as his oldest son who preceded him by one year and five days to the land of a great reunion beyond death's door.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY.

F. A. MOHR, city superintendent at St. Louis, Mo., has been appointed acting general manager of the Gulf Division, Dallas, Texas, vice S. M. English, deceased..

A. CONFERENCE was held in the office of General Manager T. W. Carroll, of the Eastern Division during the week of January 12, which was attended by superintendents from all districts.

A. L. JAMES, division inspector, has been advanced to the position of division traffic supervisor at Dallas, Tex.

S. R. CROWDER, traffic layout engineer, has started on a trip which will take him to Chicago, Kansas City, and Dallas, in connection with new office work under way in these cities.

A. P. ACHIMORE, of the engineering department, New York, is in Chicago in connection with the transfer of the new main office to new quarters. Before returning Mr. Achimore will visit Kansas City, Dallas and Memphis.

S. M. BARR and L. F. Wright, of the engineering department, New York, are in Kansas City in connection with the new office work now under way there.

E. L. HUNT, chief clerk in the office of G. M. Yorke, vice-president in charge of plant, New York, has resigned to enter other business.

HERMAN GETZ of the district commercial superintendents' staff, Charlotte, N. C., has been appointed office manager at Savannah, Ga. The title of C. H. Mulford has been changed to that of city manager of Atlanta.

AT ST. PAUL, MINN., on the evening of January 24, the members of the Association of Western Union Employees held a sleigh ride party which was much enjoyed by all who attended. The Association Local held a business meeting on January 9, A dance party followed the business session. A. H. Fisk, president, and Miss Lucille Perkins, secretary, had charge of the arrangements.

J. M. CAREY, manager at Oswego, N. Y., has resigned from the service to become manager of the Oswego office of E. W. Wagner & Company, brokers.

INSTALLATION of the equipment in the new cable office, 38-40 Broad Street, New York, has been begun.

AT MERIDIAN, MISS., extensive improvements are to be made in the company's facilities and plant.

Eastern Division.

Effective February 1, 1920, the districts and divisional offices in the Eastern Division will be as follows:

District 1—Headquarters New York City; District Commercial Superintendent W. A. Sawyer; Territory, New York State, exclusive of Greater New York and Long Island.

District 2—Headquarters Jersey City; District Commercial Superintendent, E. P. Griffith; Territory, Erie Railroad.

District 3—Headquarters New York City; District Commercial Superintendent C. B. Horton; Territory, Connecticut, Rhode Island, New Jersey, Maryland, Delaware and Eastern Shore of Virginia.

District 4—Headquarters Philadelphia; District Commercial Superintendent J. S. Calvert; Territory, Pennsylvania, West Virginia.

District 5—Headquarters Boston; District Commercial Superintendent C. F. Ames; Territory, Massachusetts, New Hampshire, Vermont and Maine.

District 6—Headquarters St. John; District Commercial Superintendent C. W. McKee; Territory, Nova Scotia and New Brunswick.

District Columbia—Headquarters Washington, D. C.; General Superintendent, H. F. Taff; Territory, District of Columbia.

Divisional offices—Baltimore, V. J. Albert, City Superintendent; Boston, C. A. Crane, City Superintendent; Buffalo, A. Woodle, City Superintendent; Philadelphia, T. B. Kingsbury, City Superintendent; Pittsburg, E. R. Collins, City Superintendent; Rochester, J. L. Brady, City Superintendent, Syracuse, E. A. Baird, City Superintendent.

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New York Western Union.

All of the locals of the Metropolitan Division, Association of Western Union Employees have joined forces for the purpose of giving an entertainment and dance at the Palm Garden, New York, on Tuesday evening, February 24. A program of professional entertainment is being arranged.

L. P. Tebeau, chairman of the joint committee, announces the appointment of the following active committees: Arrangements—M. M. Green, chairman, and W. Jacobs, Edna C. Eifler, C. A. Kilfoyle, F. J. Sheridan. Reception—T. M. Brennan, chairman, and the presidents of all locals. Music—D. E. Van Orden, chairman, and T. Skidmore, A. E. Wilgus, J. J. Coronato, Miss A. B. Benson. Tickets—S. C. Crumpton, chairman, and all local secy-treasurers. Guests—R. F. Murphy, L. P. Tebeau, H. M. Heffner, F. A. Hoag and C. F. Bresnan. Printing—Julius Kimmel, chairman, and P. C. Licari, R. Jablin, E. M. Reiter, W. A. Young. Finance—J. J. Zopf, chairman, and J. Gschwind, Mary E. Saunders. Floor committee—E. J. Freund, chairman, and C. A. Plants, J. N. Kelly. The floor committee will be assisted by representatives from each of the twenty-two local organizations, and the reception committee will be assisted by an auxiliary committee of ladies.

On account of the space limitations at the Palm Garden the sale of tickets has been restricted to 2,000.

M. J. DUGGAN, chief dispatcher in the Chicago main office, was a recent visitor in the New York office.

FORMER MEMBERS of the New York staff who died recently are: Harry Ames, on January 20; Joseph Hall, January 20, and F. L. Eastman.

A BABY DAUGHTER has arrived at the home of R. M. Christian.

Western Union Lake Division.

F. L. LE TOURNEAU, formerly manager at Springfield, Ills., has been advanced to the position of commercial agent of the third district, with headquarters at Chicago.

B. C. NELMS, recently of Bloomington, Ills., has been appointed manager at Springfield, Ills.

H. R. PACE, manager at Rock Island, Ills., has been transferred to Bloomington, Ills., as manager.

G. A. TRAPP, of Ottawa, Ills., has been promoted to the managership of the office at Rock Island.

C. W. BRUNER, formerly in the naval service, has been appointed manager at Lake Forest, Ills., vice Miss L. Murray, resigned to be married.

H. C RINEAR, of Superintendent A. R. McGrath's office, has resigned from the service to enter the insurance field.

A. A. BURR, city superintendent, Detroit, Mich., has returned from a trip to New York.

FRANK B. BRADLEY, has been appointed district commercial manager of the city of Detroit. Mr. Bradley was formerly manager at Fort Wayne, Ind., and recently returned from military duty.

MISS ANNA UNIUH, secretary to the city superintendent, has returned to duty after a couple of months' leave of absence on account of illness.

MANAGER GEORGE A. SEXTON, of Shelbyville, Ills., reports that Charless D. Parish, an ex-messenger and operator in that office has been appointed assistant cashier of the First National Bank of Shelbyville.

CHICAGO MAIN OFFICE: In the list of chief operators and assistant chief operators published in the January 1 issue of TELEGRAPH AND TELEPHONE AGE, the name of Edward F. Wach was inadvertently omitted. Mr. Wach is assistant chief operator of the main operating department and is the editor of the employees' magazine, *The Telegraph World.*

Death of Harry R. Monohan.

Harry R. Monohan, division supervisor of equipment, Gulf Division, Western Union Telegraph Company, Dallas, Tex., died in that city at 7 a. m., January 27. The cause of his death was influenza.

Mr. Monohan entered the telegraph service when he was but a boy, fifteen years ago. He was first employed as office boy in the office of the electrical engineer of the Postal Telegraph-Cable Company, New York; later becoming draughtsman and chief draughtsman in that office. About eight years ago he entered the service of the Western Union Telegraph Company in the engineering department, New York, and after a thorough training in engineering, was transferred to Dallas. where he remained until the time of his death. His death is felt as a keen loss by all of his New York and Gulf Division associates, as he had a particularly lovable disposition. Those who had the privilege of knowing him intimately regarded him as one of the brightest, sanest, and most likeable of their acquaintances.

As we go to press we learn that Mr. Monohan's wife and young daughter also are ill with influenza.

IN June, 1884, Grover Cleveland, Governor of New York State, signed a bill requiring telegraph and telephone wires to be placed underground in cities having populations higher than 500,000.

THE general employment of hard-drawn copper wire for telegraph and telephone purposes was begun in the United States in the year 1884.

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POSTAL TELEGRAPH-CABLE COMPANY

C. M. BAKER, general superintendent of plant, Chicago, was a New York business visitor, January 19 to 23.

J. G. BLAKE, superintendent, first district, Western Division, was in New York on a business trip recently.

E. P. TULLY, assistant to the general manager, left New York on January 23, for New Orleans. While in the south Mr. Tully will visit a number of the larger offices.

JOHN DORAN, superintendent of the complaint and claim department, New York, has returned to his office after an absence of several weeks on account of illness.

W. C. DAVIET, assistant to the general manager, was an official visitor during January at Buffalo, Rochester, Syracuse, and other New York cities.

C. A. COMSTOCK, assistant to the general manager, has returned to New York from an inspection trip to offices in Indiana, Ohio and West Virginia.

RUFUS GOULD, of the plant department, has returned from a trip to Florida and Cuba.

MANAGERS APPOINTED: C. D. Tamblin, Manchester, N. H.; H. M. Gersbach, Elkhart, Ind.; Clara Miller, Elgin, Ills.; J. A. Crawford, Wagram, N. C.; A. Burns, Eaton, Ohio; A. P. Ramirez, Gallup, N. M.; Selah Heath, Cornelia, Ga., and Fannie Moreno, Lexington, Neb.

W. H. JACKSON, for many years in the service of the Postal Telegraph-Cable Company at Birmingham, Ala., has retired from the service and has formed a partnership with R. L. Hayes of Birmingham, to carry on a real estate and insurance business. Mr. Jackson is one of the most popular telegraph men in the south and has been one of the Postal Company's most valued employees.

C. S. RINDFLEISCH, night chief operator of the Postal Telegraph-Cable Company's office at Cleveland, O., is in Florida inspecting his timber and lime phosphate interests in that state. Mr. Rindfleisch's property is close to the winter home of Thomas A. Edison at Fort Myers.

New York Main Operating Department.

OLD TIMERS on the force here express regret in the death recently in Chicago of Gus Carroll, well known telegrapher.

GEORGE KEENER, who works the Albany, N. Y., local, is in a hospital due to an attack of pneumonia.

W. B. CAMPBELL, quadruplex chief operator, is absent on account of illness.

A. AUSLANDER, of the St. Louis, Mo., circuit, has returned to duty after an illness of two weeks.

Philadelphia, Pa., Postal.

C. B. YOUNG, manager at Wilmington, Del., is looking forward to the early transfer of his office to a more prominent location.

MISS A. F. TAYLOR, has been appointed operator at Pottsville, Pa., where she is assistant to manager George F. Lord.

H. A. MCCANNA, for many years manager at Lancaster, Pa., is absent on an extended leave, owing to ill health.

C. E. BAGLEY, superintendent, recently visited the offices at Allentown, Bethlehem, Carlisle, Conshohocken, Coatesville and Norristown, Pa.

AT NEW HOPE, PA., a new 25-wire main line switchboard has been installed by electrician A. G. Carpenter of Philadelphia. Thomas O'Rourke is station lineman at New Hope.

THE "LIVE WIRE CLUB," composed of Postal employees in Philadelphia, held its first entertainment during the first week in January. Harry Smith is president of the club; Dennis Smith, vice-president; Kathryn Gilson, secretary, and Mary Fellin, financial secretary. Plans are under way for other get-to-gether affairs to be held in the near future.

THE THIRTY-SECOND annual meeting of the Electrical Aid Society of Philadelphia, was held at Mayers Drawing Rooms, 1620 North Broad Street, on Friday evening, January 16. The annual report was read by President Chas. A. Huver. The Society being in excellent financial standing, and an exceptionally large increase in membership. The dues were increased from 50 cents per month to 60 cents per month. After the meeting, refreshments were served and followed by a dance. The following officers were elected for the ensuing term; John A. Chapman, president; George J. Wells, vice-president; W. E. Vanarsdall, recording secretary; R. C. Murray, financial secretary; J. H. Wilson. treasurer. Executive Committee—Andrew S. Weir, Frank E. Maize, Edward T. Aiken, Chas. F. Myers. Trustees—John C. Smith, Chairman, William S. Stewart, Richard H. Conway.

JOHN ELLIS, of the plant department, New York, and J. P. O'Donohue, division electrical engineer, were recent Philadelphia visitors.

Postal Western Division.

C. A. COMSTOCK, assistant to the general manager, New York, is on a trip of inspection to offices in the Western Division.

M. E. BOURKE, operator at Peoria, Ill., has been advanced to the managership of the office at Galesburg, Ill.

PASCAL DUNN, a graduate of the Grand Rapids, Mich., telegraph school, is acting as relief manager at Ypsilanti, Mich.

(Continued on page 86.)

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WHEN the boys inquire as to new tire equipment, point out the better service offered in HEAVY SERVICE TRACTION TREAD.

Here's a tire that is especially built for the hard trials of messenger service — two plies of heavy motor cycle fabric and a wear-resisting herringbone tread make it the most serviceable tire on the market.

United States Cycle Tires are Good Tires

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M. C. HALLADAY, who has been acting as relief manager has been appointed manager of the office at Pontiac, Mich.

G. G. VETTER has been appointed manager of the office at Grand Rapids, Mich. Mr. Vetter has been in the service during the past fourteen years, having served as manager at Buchanan, Mich., Benton Harbor, Mich., Battle Creek, Mich., and at Kalamazoo, Mich. In each of these positions Mr. Vetter displayed ability of a high grade and the results of his managership of the offices named were highly satisfactory.

A. F. DELL, manager of the office at Traverse City, Mich., has returned to duty after a two weeks' vacation.

MRS. O. MURRELL, manager of the Dowagiac, Mich., office has been acting as relief manager at Traverse City and Reed City, Mich.

J. YARNELL, manager at Reed City, Mich., is on vacation attending an annual family reunion.

ROY RUSSELL SIMPSON, who was audit clerk of the first district previous to the time our country entered the late war, has returned from overseas duty and is again at his desk. Mr. Simpson enlisted in the military service as a private, but his ability in service won for him the rank of lieutenant.

T. R. ROBINSON, for twenty-seven years in charge of our Greenville, Ill., office, died recently after a short illness.

Buffalo, N. Y., Postal.

J. KELLY, operator, has resigned from the service and has been succeeded by J. A. McGowan.

P. H. IREY, has been added to the regular operating force.

THE MAIN OPERATING DEPARTMENT has an up to date, spic and span appearance since Nicholas Hamm, custodian, was assigned to the task of keeping the equipment and the quarters in good condition.

MISS CARRIE D. REYNOLDS, of the Buffalo office, is in Oakland, Calif., having been called there by the death of a sister.

Niagagra Falls, N. Y., Postal.

W. C. DAVIET, assistant to the general manager, New York, was a welcome visitor here on January 23.

MRS RUTH MACK has been appointed telephone clerk, vice Marjorie Creaght.

MARY DICKMAN, has been appointed clerk to the manager.

Albany, N. Y., Postal.

FRANK HART, operator, has been transferred from Poughkeepsie, N. Y., to this office; Miss E. G. Woolsey succeeding him at the former office.

ARTHUR STRANG has been advanced to the position of assistant manager at Troy, N. Y., vice William Forrest, resigned. Paul Spring, from Utica, N. Y., relieves Mr. Strang as operator.

GEORGE F. LAWLER, manager at Utica, N. Y., has about the same difficulty holding women clerks as the telephone companies experience. His latest loss is Miss Esther Samuels, who has resigned to be married.

W. M. PRUYN, manager, and Mr. Andrews, chief operator of the Albany main office, are being congratulated upon the excellent showing they have made in handling promptly the large increase in telegraph press matter being transmitted as a result of the trial by the state legislature of the recently suspended five Socialists who were elected to represent New York City districts. Manager H. Gorham, of the Capitol office, also is entitled to credit for his successful efforts in keeping press moving.

AT ELMIRA, N. Y., E. A. Sawyer has been appointed operator, vice T. F. Hanrahan, resigned.

AT SYRACUSE, N. Y., L. M. Goff has been promoted from billing clerk to assistant cashier. R. Reed has been advanced to the position of billing clerk, and has been succeeded as clerk by Miss Carrie Holden.

AT NORTH TONAWANDA, N. Y., Mrs. L. F. Linderman has been appointed clerk, vice Miss G. Towne, resigned.

San Francisco Postal.

WILLIAM HEARN, formerly superintendent of the first district, Pacific Division, was a San Francisco visitor on January 10.

FRANK ARNSBERGER, day wire chief, is confined to his home on account of an attack of pneumonia.

C. O. WILLETTE was, on January 1, appointed day quad chief of the main operating department.

N. F. HARRISON has been appointed assistant to the late night chief, vice C. O. Willette.

M. J. WOLINSKY, of the first New York circuit, is absent on account of sickness.

THE TELEGRAPH SCHOOL, conducted evenings by Mrs. A. B. Deal, day monitor, is developing a number of promising students.

THE FAST MORSE SENDERS of the San Francisco office are brushing up on their Phillips' code abbreviations so they will be able to make speed records in handling the anticipated large file during the Democratic National Convention to take place in San Francisco on June 28, next.

A. D. BLAKE, who from 1913 to 1918 was employed in the Denver, Colo., office, is now with the Federal Reserve Bank of San Francisco, having recently been transferred from Washington, D. C.

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RADIO TELEGRAPHY.

Radio Corporation of America Notes.

E. J. NALLY, president, accompanied by Mrs. Nally, is on the Pacific coast, on a business trip.

THOMAS M. STEVENS, recently marine superintendent at San Francisco, has been appointed superintendent at Baltimore, Md., vice Frank Chapman, resigned.

WILLIAM VERNON MOORE, arrived recently from England on the *Royal George,* after a five years' absence at the fighting front, and has resumed duty in the transoceanic division of this company.

EFFECTIVE, JANUARY 1, the following staff changes are announced: Ira J. Adams, appointed patent attorney, succeeding H. G. Ogden, resigned. Roy A. Weagant, at his request, assigned to special research and experimental work, with the title of consulting engineer, reporting to the president. E. F. W. Alexanderson, appointed chief engineer, reporting to the president. Alexander E. Reoch, appointed plant engineer in charge of construction, operation and maintenance of high power stations, reporting to the president.

New Marconi Organizations.

A company has been formed in London under the title of the Marconi Scientific Instrument Company, Ltd., with a capital of $50,000, the main objects of which are the manufacture and sale of amateur telegraph and telephone apparatus, under license granted by the Marconi Wireless Telegraph Company, Ltd. The company will also repair and remodel obsolete apparatus. The first directors of the company are Henry W. Allen, W. W. Bradfield, C. Mitchell, W. W. Drury and Charles E. Ward.

There has been formed in England the Marconi Osram Valve Company, Ltd., the directors being Henry W. Allen and Christopher Wilson. H. W. Corby is secretary.

LEWIS M. CLEMENT, engineer, Western Electric Company, New York, read a paper on "Some Uses of the Audion in Present Radio Receiving Systems," at the January 23 meeting of the Radio Club of America, held in the engineering building, Columbia University. The paper dealt with the design of amplifiers, oscillators and modern receiving equipment. He emphasized the importance of designing the auxiliary apparatus to meet the characteristics of the type of audion bulbs available in given installations.

A TECHNICAL PAPER on "Multiplex Radio Telephony and Telegraphy" will be presented before the Institute of Radio Engineers, 29 West 39th Street, New York, on the evening of February 4. The authors of the paper are F. M. Ryan, J. R. Tolmie and Roy O. Bach. Mr. Ryan will present the paper, which describes detailed and practical experiments in duplex and quintuplex radio telephony, indicating new possibilities in the direction of full utilization of antennas at several transmitting wave lengths.

A Row in the Incubator.

THE INCUBATOR OF GOVERNMENT OWNERSHIP OF UTILITIES.

The only difficulty we have had with this article was in thinking up an appropriate heading for it.

In England they have had government owned and operated telegraphs and telephones for many years past, and it appears they are now threatened with government owned radio.

However, in order to disclose what we mean by the title given this story, we quote the following editorial from a recent issue of the *Electrical Review* of London:

"The announcement that the government has appointed a committee to advise it on Imperial wireless communication, and to prepare a complete scheme, will be received with mixed feelings by the public, and especially by those who have suffered at the hands of the government in this matter. The committee contains many distinguished names, but not one professional expert experienced in the class of work upon which it is to be engaged. Presumably the eminent gentlemen of whom it is composed will give their services to the government, and we honor their patriotism, while we 'despise their judgment,' as the western farmer said when his bull-calf charged the locomotive. When will our scientists learn that knowledge is worthy of its hire. It is this practice of gratefully accepting the opportunity to work for nothing that has made the scientific investigator and the engineering expert objects of disdain to the Civil Service, and has taught the latter that scientific advice need not be paid for.

"And now what is this committee going to advise the government to do? To erect high-power stations with the aid of the Post Office staff? Or is the job to be given to the Admiralty? We know these government departments—how they work, and how they husband the resources of the nation; how they provide land telegraphs—at a price—and how they conduct the telephone service—and we can imagine how they will carry on a world-wide wireless service. Indeed, the wireless record of the government, and especially of the Post Office, is a ghastly tale of blunders, evasions, scandals, and double-dealing such that we should not have supposed any cabinet would care to stir up the mud again. But, as we have remarked elsewhere, it is not responsible for the mistakes of its predecessors, and which wears the white flower of a blameless life when it starts work—not for long.

"The original contracts should have been carried out, without delay and without political mud-slinging; then we should have had an Imperial wireless service at work during the war, and justice would have been done. Now, of course, in view of what has passed, every effort will be made to flout the British wireless company to which we owe so much of our success in wireless telegraphy in wartime, and the Post Office will proceed to 'muddle through' in its own inimitable way, with the help of amateur advice, gratis."

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THE CABLE.

J. C. BAILEY, assistant superintendent of the Western Union cable station at Bay Roberts, N. F., is visiting in New York, accompanied by Mrs. Bailey.

ERNEST ANGEL, supervisor at the Western Union cable station, North Sydney, N. S., is in New York for a few weeks on company business.

The Miami, Fla., Cable Station.

It is expected that the Western Union Telegraph Company's new cable station at Miami, Fla., will be ready for service in April, next.

Cables from South America, the Bahamas and Cuba will land at Miami Beach, and the station will be one of the most important cable offices in America. A school for the instruction of operators is being established in Miami, and it is expected that within a short time thirty-five or forty Miami young people will be busy learning how to operate cable tape perforators and read cable slip. H. S. Wright is chief operator of the Miami office.

Cable Staff Changes.

In the service of the Eastern Telegraph Company the following changes and promotions have recently taken place: Arthur J. Besly has been appointed superintendent at St. Helena. Andrew K. Murphy, from Gibraltar, has been appointed superintendent at Aden. Francis W. Silwood has been appointed superintendent of London stations, James H. Stephens has been appointed superintendent of London training schools. Charles Tothill, from Aden, has been appointed superintendent at Cape Town. John J. Armstrong, from Porthcurnow, has been appointed superintendent at Durban. Hugh Wallace Adair has been appointed assistant superintendent at Marseilles. John S. Cartmel, from Durban, has been appointed assistant superintendent at Aden. Arthur Jones has been appointed superintendent at London. Thomas Minto has been appointed assistant superintendent at Cape Town. James Fraser has been appointed assistant superintendent at Suez.

In the service of the Pacific Cable Board, the following staff transfers have taken place: F. H. Harrison, Sydney to Southport; T. R. Blackley, Southport to Fanning; O. Vincent and H. Baxendale, from Sydney to Bamfield; E. A. M. Wilson, Sydney to Norfolk; R. S. M. McCombie, Bamfield to Fanning; C. M Boult, to Sydney; T. F. Price, Halifax to Auckland; J. T. Coote, Melbourne to Fanning, and H. K. Balcombe, Montreal to Calgary.

Restoration of Direct European Wires.

When the war started in August, 1914, direct telegraph circuits worked between cities in England and cities on the continent of Europe were interrupted, and the wires, the continental terminals of which were in possession of the allies, were taken over for military uses.

Within the past few months commercial service carried on over direct wires has been gradually restored and the British Postoffice Telegraphs now have direct wires from London to the following places: Bordeaux, Boulogne, Calais, Dunkirk, Havre, Lyons, Marseilles, Nantes, Paris Central, Paris Bourse, Genoa, Milan, Rome, Antwerp, Brussels, Ghent, Amsterdam, Hague, Rotterdam, Berlin, Bremen, Cologne, Dusseldorf, Emden, Frankfort on Main, Hamburg, Leipzig, Magdeburg, Berne, Geneva and Zurich.

Diversion of the German Cables During the Late War.

At the fifty-sixth ordinary meeting, in London of the India Rubber, Gutta Percha and Telegraph Works Company, Ltd., on December 18, last, the chairman in making his report submitted some interesting information about the diversion of the German pre-war submarine cables.

Early in the war the company was engaged in diverting the German Emden-Teneriffe cable into St. Nazaire and in making repairs to French government cables; dangerous work which ended more than two years afterwards with the sinking of their cable ship and the accompanying French man-of-war in Funchal harbor, Medeira, by a German submarine. Far the most important work accomplished by the *Dacia,* under the supervision of submarine cable engineers (Mr. Crawford and Mr Robinson successively) was the diversion of the remainder of the German Emden-Teneriffe cable so as to connect Brest with Casablanca in Morocco and the diversion of the German Teneriffe-Monrovia cable so as to connect Morocco with Senegal. The Emden-Teneriffe cable was first cut off Brest a length picked up and relaid into Brest. The same operation on a larger scale was then performed off Casablanca, with the result that after the necessary connections had been made, this second portion of the German Emden-Teneriffe cable was converted into a French Brest-Casablanca cable. Similar work was carried out on the German Teneriffe Monrovia cable thus extending the French cable from Casablanca to Dekar in Senegal. Their cable engineers, after fully considering the difficulties held that those were possible operations, but there were no signs that any other English expert whether governmental or in private employment shared in this view; while the electrical advisers to the French government declared the scheme to be impracticable owing to the depth in which the cable lay. Imagine fishing for a cable in pitch darkness imagine trying to cut the cable in those circumstances in the hope of being able to haul up one of the ends thus set free to the surface; imagine pulling it up vertically through nearly three miles of water, then steaming away while continuing to drag up the cable from the bottom, coiling it up on board without any kinks or unperceived injuries, and

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finally relaying it exactly where required; imagine all that and scepticism as to the possibility of success became more than excusable. That remarkable performance was absolutely unique in the history of submarine cable enterprise, and that whether one looked to the length of the cable lifted (1,200 miles) or to the average depth of the water in which it lay. Their staff, without exception worked splendidly, but the chief credit for their success must be awarded to their managing director, Mr. C. H. Gray. He conceived the scheme and advised the Board to take the risks involved; he persuaded the French government to neglect the doubts expressed by their expert advisers, and he inspired all hands with the energy essential to success in such a feat. The position was fully realized by the French government, for the Foreign Office has recently transmitted to Mr. Gray the Crosss of Chevalier of the Legion of Honor, which had been awarded to him by the President of the French Republic for services during the war. The report and accounts for the year were then adopted and the distribution of a dividened of 15s. per share (10 per cent. per annum) on the ordinary shares was approved.

Underground Cable Wanted.

The board of fire and police commissioners, New Haven, Conn., is asking for bids for 7,000 feet of 30-conductor, lead covered underground cable; No. 14 B. & S. gage conductors. Specifications of the International Association of Municipal Electricians to govern.

Telegraph and Telephone Equipment for Brazil.

The state owned railroad, known as "A Estrada de Ferro de Carlos Barbosa a Alferdo Chaves," and now under construction in Brazil is reported to be in the market for telegraph and telephone equipment, including line material. The material will be purchased and paid for by the government of the State of Rio Grance do Sul, Brazil, which has ample funds for the purpose. The chief engineer, whose address can be obtained from the Bureau of Domestic and Foreign Commerce, Washington, D. C., by referring to file No. 429, is in charge of the selection of material. He is a graduate of an American engineering school and understands English.

Foreign Telegrapher Wants United States Postal Cards.

W. Schenker, telegraphist, whose address is Militarstr, 32, Zurich, Switzerland, writes that he will be pleased to exchange Swiss scenic postal cards for cards from American telegraphers showing American views.

Broker Telegraphers Entertainment.

The broker telegraphers of New York and vicinity will hold an entertainment and dance in the Grand Lodge Room of the Masonic Temple, Sixth Avenue and Twenty-third Street, New York, on the evening of February 21. The entertainment committee consists of J. W. Dunn, F. W. Towne and D. V. Nelson. Mr. Nelson, secretary and treasurer of the Committee, is located at room 504, No. 44 Broad Street, New York.

Bowling by Telegraph.

On February 21 will be held the first international industrial telegraphic bowling tournament. It is expected there will be 300 team entries.

Telegraphic bowling tournaments have in the past proved a great success, particularly on the western coast, where the Pacific Coast Bowling Association has been couducting tourneys during the past fifteen years. The tournament to be held on February 21, this year, will be the greatest telegraphic meet ever held in the history of the bowling game.

Electricity and Magnetism.

A First Book of Electricity and Magnetism, by W. P. Maycock, is a work which constitutes a thorough course in elementary electrical engineering. The book is pocket size and contains 350 pages, covering in an instructive manner all of the principles concerned in the design and operation of electrical instruments. One especially valuable feature of the book is a section on electrical experiments which enables the student to develop and prove the theories discussed throughout the text of the work.

The price of the book is $1.25, and copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

STANTON M. CHILD, steel equipment engineer, 395 Broadway, New York, and who specializes in telegraph and telephone office equipment, has secured the agency for the Uhl Art Steel products. The line includes serviceable adding machine tables, typewriter tables, desks, and stools and chairs of up to date design and manufacture.

AS A MEMORIAL to its employees who lost their lives in the late war, the Western Electric Company is about to convert the ten acre Richmond track at Hawthorne, Ills., into a model recreation grounds for the use of employees. Plans have already been made outlining the work to be undertaken.

The Old Wire Chief says: "The elements of society being duly considered, the wonder is not when strange things happen; but, rather, when things run smoothly."

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OBITUARY.

Death of N. C. Kingsbury.

Nathan Corning Kingsbury, for the last nine years first vice-president of the American Telephone and Telegraph Company and one of the recognized experts of the country on telephone operating problems, died suddenly of heart disease on January 24 at his home, 39 East Sixty-fifth Street. He was at his office as usual January 23, and appeared to be in the best of health. Death came peacefully while he was sleeping. The funeral was held Monday afternoon January 26, at 2 o'clock at the Collegiate Church, Forty-eighth Street and Fifth Avenue, New York.

Death of Joseph A. Weaver.

JOSEPH A. WEAVER, formerly chief book-keeper, Western Union Telegraph Company, at St. Louis, Mo., died at Chicago on January 1, after an illness of several years. Mr. Weaver was born, August 12, 1854, at Cincinnati, O., removing to St. Louis at the age of four, with his family. He started work as a messenger for the Western Union and was continuously in their service for forty-three years, for the last twenty-five of which he was the chief book-keeper at St. Louis. Many of the present employees of the telegraph company were trained under Mr. Weaver and he is well remembered although for the past six years he has been retired and living in Chicago. He was pensioned, January 1, 1914.

Mr. Weaver is survived by an only sister, Mrs. Wm. Britt of St. Louis, and his widow and three sons, one of whom, J. E. Weaver, is employed in the division auditor's office at Chicago.

CHARLES E. HIGDON aged seventy-two years, a veteran of the Western Union service, died recently in Cincinnati, O. Mr. Higdon entered the service of the company as messenger boy in the sixties of the past century and soon became a good telegrapher, having been continuously employed in the Cincinnati office since 1872. Mr. Higdon was one of a dozen operators who volunteered for service at Johnstown, Pa., during the disastrous floods which occurred there thirty years ago. Although eligible for retirement on pension, Mr. Higdon remained on duty during the late war activities. He is survived by his widow, three sons and one daughter.

ASSESSMENT No. 669 has been levied by the Telegraph and Telephone Insurance Association to meet the claims arising from the deaths of James A. Anderson, at New Orleans, La.; William W. Kelser at Pittsburg, Pa.; Joseph Purcell at St. Louis; Samuel M. Brown at Salt Lake; John Isham at So. Coventry, Conn., and William Atkinson at Cincinnati, O.

SAMUEL M. BROWN, aged 76, for many years, superintendent of telegraph of the Denver and Rio Grande Railroad Company at Leadville, Colo., died at Salt Lake City, Utah, November 30.

WM. SALISBURY, aged 56 years, superintendent of plant of the Western Union Telegraph Company at Omaha, Nebr., died at Harper, Cal., December 25, 1919.

WM. T. ATKINSON, an old-time telegrapher, died at Cincinnati, O., on December 27, 1919.

GEO. C. THOMPSON, aged 81 years, identified with the telegraph service most of his life at Albany, N. Y., died at Syracuse, N. Y., Jan. 4.

FRANCIS H. ZIMMERMAN, aged 82 years, an old-time telegrapher of Binghamton, N. Y., died on January 12.

JOSEPH WERT, aged 81 years, manager for the Western Union Telegraph Company at Carlisle, Pa., died on Nov. 24, 1919.

Telegraph and Telephone Life Inurance Association.

Proposed amendments to the constitution of the Telegraph and Telephone Life Insurance Association include the following, which refers to new rates deemed necessary to insure the future stability of the outstanding insurance obligations.

FULL GRADE.

				per month.	*per annum.*
Class	A	between	18 and 21	$1.00	$12.00
"	B	"	21 and 25	1.25	15.00
"	C	"	25 and 30	1.50	18.00
"	D	"	30 and 35	1.75	21.00
"	E	"	35 and 40	2.00	24.00
"	F	"	40 and 45	2.50	30.00

HALF GRADE.

				per month.	*per annum.*
Class	A	between	18 and 21	$ .50	$ 6.00
"	B	"	21 and 25	.65	7.80
"	C	"	25 and 30	.75	9.00
"	D	"	30 and 35	.90	10.80
"	E	"	35 and 40	1.00	12.00
"	F	"	40 and 45	1.25	15.00

The above rates have been computed to cover all future requirements and to provide adequate reserves to meet all claims as they mature. The association reserves the right, however, from time to time, to revise its rate in accordance with its accumulated mortality experience. The association further reserves the right, in lieu of any reduction in rates that may be made possible by favorable mortality experience, to waive further collection of premiums from certificate holders who have passed, or may pass, such age limits as it from time to time may determine.

Membership in the third division is subject to all the conditions of the constitution and by-laws of the association, except as to the basis of payment of moneys to the association, the first division being on the assessment plan, the third division on the flat rate plan.

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Electric Communication in Railroad Service.

When the railroad properties are returned to their owners the organized railroad telegraph superintendents will very likely remain as the telegraph and telephone division of the American Railroad Association.

The telegraph executives will be in a better position to plan and carry out improvements when their recommendations have no further to travel than to the operating heads of the individual railroad systems. Under federal control proposals not directly concerned with immediate operating needs are not sympathetically considered; certainly not, when they call for the expenditure of money which must be obtained from the government administration.

The return of the roads will rectify this condition, and the superintendents of the "backward" lines will be in a position to profit from what they have learned about modern methods and future possibilities, during their association with the staffs of the more progressive roads.

During the past four years all of the technical committees of the superintendents' association have done excellent work in compiling specifications covering standard construction, and unformity of methods and materials should, in due course, become common practice on all roads.

Committee No. 5—Telegraph and Telephone Development, and Committee No. 6—Message Traffic, have opened up new possibilities looking to improved service and real economies. Committee No. 5, J. A. Jones, chairman, has in its reports for 1918 and 1919 presented information relative to new developments in electric communication which should be availed of with the least possible loss of time.

Telegraph and telephone superintendents of the large trunk lines should plan to set up experimental and development laboratories as soon as practicable after the roads are released by the government. This can be done on a small scale at first, and there is no doubt that the results attained will in a short time clearly justify the expense necessary to extend test and research facilities.

Where several railroads have telegraph headquarters in one city it might be best to establish one fairly complete laboratory to be maintained by joint contribution of cost, rather than for each road to carry on work in a small way.

Officials who read the article in this issue of TELEGRAPH AND TELEPHONE AGE on "The Importance of Invention in the Bell Telephone System," by Thomas D. Lockwood, cannot fail to realize that improvements in methods of electric communication are entirely affairs of the laboratory. No superintendent should allow his organization to lag behind; all should aim to be in the van, and it should be realized that the future will undoubtedly see startling advances which will redound to the credit of those who lead the way.

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THE PSYCHOLOGY OF MESSAGE DELIVERY

It has often been said by those inside the service, as well as by outsiders, that the telegraph companies spend millions to make it possible to transmit a telegram from New York to San Francisco —or between any other two cities—in ten minutes, while little has been accomplished in reducing the time (from ten minutes to two hours) taken to deliver the same telegram from the telegraph office to the addressee; generally less than a mile away.

What such statements contain in the way of fact would form a subject for no end of discussion among telegraph managers. While it may be true that, seemingly little has been accomplished to rectify this condition, it is true that a very great deal of thought has been devoted to the subject by past and by present telegraph executives and managers.

Superintendents and office managers in all parts of the country have had one common experience in connection with message delivery: that is, that here and there throughout a district may be found a delivery clerk who stands out head and shoulders above other clerks in ability, faculty, intuition, or whatever one may call it, to effect satisfactory delivery of messages. Now, while it may be true that genius along any line of endeavor may be rare, it is still true that what one person can accomplish in a given position may be duplicated, or nearly approached, by many others if the psychology of the art is given due consideration, and the principles deduced therefrom intelligently applied.

Perhaps the most famous message delivery ever effected was the "Message to Garcia." The late Elbert Hubbard once told the story, and in the telling immortalized the messenger—Captain Rowan of the United States army. Garcia was beleagured in the interior of Cuba; cut off by the Spanish army from communication with coast cities, telephones, mails and telegraphs, and in those days we had no airplanes to fly over sea and land to an isolated garrison.

President McKinley had a message he wanted delivered to General Garcia of the Cuban native army. The American army authorities detailed Captain Rowan to deliver the message, and, regardless of the vigilance of Spanish sentinels; regardless of the total absence of comfort and aid; regardless of the fact that Garcia's whereabouts were not exactly known, messenger Rowan delivered the message promptly and to the right person.

It is this sort of determination to effect delivery of a message which stirs to action the brain work necessary to success, and if it is realized that in the handling of telegrams the actual delivery of the message is a function second to no other function in importance, a time might arrive when delivery failures would diminish almost to the vanishing point.

Mr. J. C. Willever, vice-president in charge of commercial department, Western Union Telegraph Company, New York, has within the past few months delved into this subject, somewhat along the lines suggested in the foregoing, and has brought together a considerable amount of exact data which throws light upon the processes of thought followed by delivery clerks who are known to be particularly successful in effecting prompt and positive delivery of received telegrams.

In what follows we have selected a number of cases where deliveries were made as the result of the exercise of gray matter. The examples we submit were selected to cover a wide range of suggestions, and desirable ends will be served if managers will have delivery clerks and all other members of their staffs study the various ways and means thought out by clever delivery department clerks to deliver promptly telegrams which at first sight seem hopeless.

ERROR AT OFFICE OF ORIGIN.

H. E. Averill, Western Union manager at Colfax, Wash., reports that his office solved the following case within a few minutes: Message addressed to H. Lacasse, in care of Mr. Tarroll. Neither party known. Telephone and city directories failed to disclose either name. Unknown at postoffice. Message examined for Morse error; no evidence. Considered possibility of error at point of origin, assuming the message had been telephoned to office. This was the right lead: letter "C" was mistaken for "T", and message was found to be in care of Mr. Carroll.

SCOUTING BY TELEPHONE.

Delivery clerk Dockendorf of Chico, Calif., had a death message addressed to E. L. Thompson, Route 3, box 16. Post office stated party had moved and that present address was "motor route A," but that this route had just been discontinued. Post office stated boundary limits of motor route A. Mr. Dockendorf then telephoned various parties in that district, which was residential, finally locating a family who knew the Thompsons. Message immediately delivered.

THE VALUE OF A GOOD MEMORY.

Miss Howard, delivery clerk at Brawley, Calif., received a telegram for Robert Hughes, Barber, Brawley, Calif. A round of the barber shops failed to locate Hughes. Something familiar in

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:he sound of the man's name caused Miss Howard :o exercise her memory, with the result that in the :ourse of a half hour she recalled seeing in a daily ɔaper the name "Robert Hughes Barker." The directories promptly did the rest.

IMPROBABLE DESTINATION.

Chief delivery clerk Barsotti, at Fresno, Calif., received a message addressed to a Mexican at No. 4126 Tulare Street. Quick thinking told him that, as the street numbers ran, Mexicans were not likely to be found in the neighborhood No. 4126; but that at 1426, there was a chance to locate the man. His deductions were correct. Result: prompt delivery.

SIMILARITY OF NAMES.

Mrs. Hawkins, service and search clerk in the Spokane, Wash., office, had in hand a telegram addressed to M. R. Cody Company, which her knowledge of the city told her was probably intended for the W. R. Cooley Company. She guessed right, there being no such concern in Spokane as the M. R. Cody Company. Mrs. Hawkins again was puzzled for a moment when she received a telegram addressed to John F. Old. Finding no party by this name in the directories her telegraph mind evolved the information that perhaps the message was intended for John F. Clark, Old National Bank Building. Again she guessed right.

MESSAGE WOULD NOT STAND DELAY.

Mrs. Haskell, delivery clerk at Bakersfield, Calif., had a telegram addressed to Tom White, R. F. D. No. 1, box 23. Now, it is important to bear in mind that R. F. D. deliveries are not particularly frequent, and there are many telegrams which will not stand such delay and still serve their purposes. A glance at the contents of the message showed that it was urgent: possibly already it had suffered delay in transmission and R. F. D. delivery would not do. Good thinking, this. Mrs. Haskell by inquiry located box 23 as at Waits station on the Southern Pacific Railroad. The message was promptly forwarded by wire and connected in time. In recognition of the good service the recipient of the telegram filed several paid messages.

ABBREVIATED ADDRESS.

Thomas M. Ferguson of the Seattle, Wash., office had a telegram addressed to E. Neewan, W. O. Pacific Company. No such person could be found listed in the directories. Mr. Ferguson noted that the message referred to a deal in axle shafts. Here was a clue. A search through the automobile section of the directory disclosed E. McEwen, Willys-Overland Pacific Company. Simple? Yes, like Columbus' up-ended egg.

TAX MAN KNOWS THEM ALL.

Telegrams received at small offices for persons living outside the city limits, and without any road or rural delivery designation are sometimes difficult to deliver. Manager Wertheimer of Walla Walla, Wash., tumbled to a good idea when he thought of the tax collector as having the address of every resident of the fields and the woods.

AN EAR FOR THE WIRE.

Manager Crawford, of Elko, Nev., had a telegram for a traveling man who had not yet reached his town. The habit of listening to what passes over the wire caused him to hear a message being sent to the same person at another city. Inquiry developed that the man was there. Enough said.

MESSAGES FOR FOREIGNERS.

Manager Michael of Bellingham, Wash., had difficulty delivering telegrams received for persons with foreign names, until he conceived the idea of calling up by telephone several people of the same nationality as the addressee; asking them if they knew the person sought. The Greeks know all the Greeks, and the Croatians know all the Croats.

WORKMEN LOCATED THROUGH UNIONS.

One manager has a searching eye and when he has for delivery a telegram for an addressee who seems to be in hiding, he analyzes the contents of the message and if there is any reference to a trade or calling in it, or any item suggesting the line of business the man is engaged in, he gets in touch by telephone with the Union headquarters representing that particular line of activity, and very often finds his man in that way.

MORSE ERRORS.

Chief delivery clerk Titus of Los Angeles office, understanding the Morse code, is able to unravel occasional garbled addresses where the address has been twisted a bit by the playful spirits of the wire. Some time ago he had a message for a party supposed to be domiciled on Stoolucerne Avenue. There is no such highway in the city of flowers and oranges; but Mr. Titus is something like the famous operator George M. Eitemiller, who in the palmy days of Morse, told poor senders that if they could not send him all of the dots and dashes in the message to just send him the spaces and he would guess the rest. At any rate, Mr. Titus was not long in detecting that Stoolucerne Avenue was what a fast sender and an indifferent receiver would do to "400 Lucerne Avenue."

ERROR IN TRANSMISSION.

Manager H. D. Jones of Palo Alta, Calif., office in scrutinizing the addresses of undelivered messages has straightened out several tangles by noting that in Morse transmission such errors as "Pope" for "Hope," "Joseph U. Sanderson," for "Josephus Anderson," "John Black," for "John T. Slack," and so on, may be made.

TYPEWRITER ERRORS.

The manager at Palo Alta also has noted that certain typewriter keyboard errors may result in puzzling cases. He cites "Gale" for "Hale," "Mason" for "Nason," "King" for "Ling," etc.

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"SEES ALL—KNOWS ALL"

Miss Parsons, delivery clerk at Vancouver, Wash., received for delivery a telegram addressed to a party "going through in auto." Can you beat that for an address? And to think that it was accepted for transmission at the originating office!

Easy for Miss Parsons! That morning when she was on her way to work she noticed many things, and anything which was not in its accustomed place, or that no one was holding by a rope, caught her eye, and her mental photographic equipment did the rest. In a vacant lot she observed a party of automobile tourists camped; and further, that one of the cars carried a Colorado license. ---Never mind, Watson, you are too late! The telegram Miss Parsons had for delivery was from Denver and in a twinkling she had a boy on his way to a vacant lot with the message.

This series of "cases" has been made up from actual happenings, and undoubtedly every telegraph office manager in the country has had similar experiences; perhaps in many instances has effected delivery of telegrams under conditions much more difficult than any of those listed here, but the subject is very important and we believe the factors of training, thoughtfulness, ingenuity, and intuition all may be exercised in improving the delivery service.

Those who daily have the handling of telegrams for delivery are prone, in time, to become discouraged; guessing that half the messages received fail of prompt delivery. This is not so: in fact, only a very small percentage of telegrams bear improper addresses, and it is only that one improperly addressed message causes more worry than a hundred correctly addressed messages that creates the idea that the proportions are reversed.

The delivery clerk who hopes to excel should study and practice the psychology of message delivery.

Pole and Post Holes in Winter.

Everybody will admit that pole and post holes should be dug when the ground is not frozen, but everybody knows that emergencies necessitate the digging of such holes in freezing weather.

The diggers make slow progress, because post hole excavators cannot be used. Picks can be used only on the first few inches of frozen soil.

Low freezing dynamite, suitable for use in the open, in winter, is becoming popular with hole crews. It takes much less time and labor merely to put down a two inch bore hole in frozen earth than to dig a twelve or fifteen foot hole. The stick or half stick of dynamite is pushed to the bottom of the bore hole tamped in (sometimes with snow) and fired with cap and fuse. It is then a quick and easy operation, after the soil has been broken up and loosened by the shot, to dig out the hole to required size.

There is little danger of unduly loosening up the sides of the holes, when the ground is frozen. But even if an occasional hole is broken out a little too wide, it can usually be depended upon to freez up solid again over night.

Safety First Epitaphs

Lies slumbering here
One William Lake;
He heard the bell,
But had no brake.
—*Detroit News.*

At fifty miles
Drove Ollie Pidd;
He thought he wouldn't
Skid, but did.
—*Rome, N. Y., Sentinel.*

At ninety miles
Drove Edward Shawn;
The motor stopped,
But Ed kept on.
—*Litte Falls, N. Y., Times.*

Here lies what's left
Of Samuel Sipe—
(Stopped in the street
To light his pipe.)
—*Cleveland Plain Dealer.*

Here rest the bones
Of William Welt;
He climbed a pole
Without a belt.

And say a prayer
For Sammy White,
Who cranked a Ford
And used his right.
—*Southwestern Telephone News.*

Asleep beneath
Is Mamie Meyer,
Who gasolined
A sluggish fire.

Here lies a man;
To get my goat
('Twas just in fun!)
He rocked the boat.
—*Our Devil.*

Money Transfer Frauds.

ROBERT R. ENGLISH, alias R. Verdene, and C B. Kelly, perpetrators of telegraph money transf frauds in southern cities were tried in a Da County, Florida, court on January 21. Engli was given four years in the penitentiary, and Kel two and one half years in the same institution. L. Jones, another imposter was arrested at Tamp Fla., in January, and is awaiting sentence. Tho who attempt this sort of swindling rarely escap Justice is relentless until satisfied.

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THE IMPORTANCE AND INFLUENCE OF INVENTION IN THE BELL TELEPHONE SYSTEM

By Thomas D. Lockwood.

An address delivered before the Telephone Society, in Franklin Union Hall, Boston, Mass., on December 9, 1919.

Scarcely more than a century has elapsed since a new power has by the genius of discoverers and the talents of inventors, been trained to the service of mankind. This power is electricity.

It is, beyond question that the highest achievement in the electrical transmission of intelligence is the speaking telephone. This comes home to us, for we all use it, and any *can* use it. It both talks and hears; and accomplishes the functions of both ear and vocal organs by a mechanism actually simpler than that with which the human being is endowed for like purposes.

FIRST PATENT GRANTED IN 1876

On the Fourth of July in the Centennial year, 1876, there was not a single telephone in commercial use anywhere, but now where are they not? The telephone was patented in March, 1876, and is, therefore, little more than forty years old; yet it has utterly transformed methods of transacting business.

By the last annual report of the American Telephone and Telegraph Company we find that in 1918 the number of exchange connections for Bell telephones alone was about ten thousand seven hundred and fifty millions, or a daily number of over thirty-two millions.

It is not necessary on this occasion that much shall be said regarding the telephone itself, and for our present purposes, after premising that the invention of the carbon microphone transmitter was itself an important improvement, and that for special purposes many refinements in detail have been introduced, it may be assumed that we are discussing a time when the telephone had already become an accomplished fact, and that our problems thus turn upon the question of how best to make it available.

TWENTY-SIX HUNDRED TELEPHONE PATENTS GRANTED

Experience has proved that every radically new, or really pioneer, invention is invariably the forerunner and promotive impulse of a multitude of improvements and subsidiary inventions. The telephone has not been an exception to this experience. As previously remarked, it is but little more than forty years since it was invented, yet within that period of time, or down to December 31, 1918, there have been granted twenty-six hundred and eighty United States patents for inventions in telephones (comprising transmitters, receivers, and amplifiers, etc.), and eleven thousand, three hundred and forty-eight more for switchboards, cables, signal apparatus, protectors, and other telephonic appliances; a total of fourteen thousand and twenty-eight patented inventions, all directly traceable to the original and parent invention.

Any consideration of the immense mass of invention required to bring the Bell System to its present status, and to continue improvement to still higher standards in the future, will be facilitated by thinking of it as being divisible into four classes, viz.,—inventions applicable to users' stations, to the central station, to the line and to the telephone circuit as a whole. Or, adopting the functional point of view, it is sometimes convenient to regard telephone inventions as being severally concerned with the operations of signaling, switching, and talking. But, howsoever we attempt to classify, we have always to keep in mind that there is no hard-and-fast dividing line between the classes; and that many important inventions partake of the characteristics of more than one of these classes.

THE STORY OF THE FIRST TELEPHONE

The earliest and simplest telephone organization is, of course, a private line uniting two stations. It is evident that even so simple an arrangement as this requires some kind of a call signal, and that if the two stations are to have equal facilities, each must have some means to send and also some means to receive a call. A telegraph key and sounder were at first used, in connection with a battery included in the circuit. This was not an invention, but an obvious expedient. A magneto machine, which by the same operation both generated and transmitted the call current, was, however, soon substituted; and since the current so generated was alternating, the use of a polarized bell as a call receiving instrument suggested itself immediately.

Invention was at this stage much in request; and in prompt response there came into being the centrally pivoted armature polarized bell (the ringer, as it is often termed), which was so perfectly satisfactory in result that, unchanged except in minor details, it has continued until the present time, and is still universally employed.

SOME EARLY HISTORY

To make the magneto call apparatus complete. two other features were requisite; i. e., the suspension switch to transfer the line connection between the telephone and bell (these being in separate branches), without any requirement of deliberate action by the user; and a contrivance responsive to the operation of the generator in sending the call, to bring the generator armature coil into circuit, and to disconnect or withdraw it after the signal had been transmitted, or when the generator was no longer in operation. A number of different forms or arrangements of both of these features were devised by several inventors.

The reason for the first was that, in the early days of the telephone, a hand switch was provided, which turned to one position to connect the telephone with the line during talking, and to a second position to connect the line with the call

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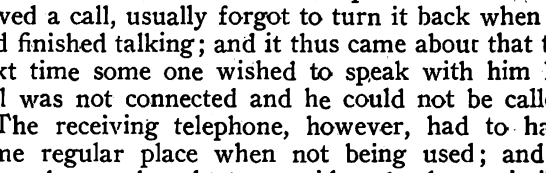
bell at other times. But the user having so turned his switch as to connect his telephone when he received a call, usually forgot to turn it back when he had finished talking; and it thus came about that the next time some one wished to speak with him his bell was not connected and he could not be called.

The receiving telephone, however, had to have some regular place when not being used; and it was a happy thought to provide a hook, or similar



support for it, which could be moved one way by its weight when placed thereon, and reversely by means of a spring when the receiver was taken up for use. Being thus movable, the hook was made to serve as the switch lever; and the user was thus enabled to automatically turn his switch in the proper direction without any action on his own part being required, except to take the instrument from its hook support when it was wanted for conversation, and to put it back to its obvious place when the talk was finished.

PLANT TROUBLES OF YEARS AGO.

The second of these initial inventions came about in an equally natural way. The impedance of the generator coil, at intermediate stations, was detrimental to both the loudness and clearness of the telephone talk; and at terminal stations diminished the sharpness of the bell call, and also was itself much subject to injury from lightning discharges.

To obviate these disadvantages a short circuit round the coil was provided, originally arranged to be broken by a push-button during the operation of the generator. It soon, however, occurred to several inventive minds that this circuit-breaker could readily be actuated by the revolving motion of the generator shaft when the crank was turned to send a call; and thus was accomplished another step towards a complete and satisfactory bell and generator apparatus.

Finally, and after the lapse of years, the improvement known as the bridging bell was developed. This was devised to meet the requirement of a magneto bell, efficiently workable on lines of many stations, and involved several features of true invention.

The magnets were made with long cores and wound with many convolutions, so that when connected across between the two line conductors the voice currents would not be shunted through the and away from the telephones. The generator w of fewer turns and was so connected between t terminal screws as to be also in bridge, and parallel to the bell magnet. Its bridge was, ho ever, normally open and arranged to be closed whi sending a call. The telephone branch, also op when at rest, was connected as a third parall bridge, controlled by the suspension switch.

This bell apparatus, while designed for poly-st tion circuits, proved, however, to be a superi station apparatus, even on lines having but o user's station, and practically superseded all pr vious arrangements.

THE FIRST TELEPHONE EXCHANGE

Within two years from the time that the tel phone appeared upon the scene, it was manife that its principal role was more than communic tion,—that it was intercommunication. And ear in 1878 the telephone exchange came into existenc The public mind now does not discriminate betwe the telephone and the telephone exchange, or, other words, it thinks—if it thinks at all—th the exchange service *is* the telephone. It is fair say that, while the telephone has made the exchan possible, the exchange has made the telephone indi pensable.

This consideration at once brings the centr station into the foreground, and the heart and e sence of the central station is the switchboard.

Without the exchange system switchboard, tel phone communication would very quickly by i immensity, become prohibitive. For, in that cas

EARLY TYPE OF BELL TELEPHONE TRANSMITTE

there would, to carry on a like business, be requir a line from each station to every other station. there are but two stations, one line only is require which does not look very formidable; but the a petite of such a non-organization grows very fa Three stations would require three lines and grou of four, five and six stations would respectively r quire six, ten and fifteen lines, and so on. As matter of curiosity, I once carried the calculati out to some extent, and found that:

For 100 stations the number of lines requir

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would be 4,950; for 500 stations, 124,750 lines; for 1,000 stations, 499,500 lines; and for 5,000 stations, 12,497,500 lines.

Of course the very idea of such an arrangement is absolutely ridiculous, and no one but a lunatic could think seriously of it; but it is worthy of mention, if for nothing else than to emphasize the wonderful utility of the switchboard.

An amazing amount of invention has, and an equally amazing number of inventions, the importance and influence of which it is impossible to overestimate, have related to switchboard work, and are combined in the highly organized and complete switchboard apparatus of the present time.

Switchboards were not new with the telephone. They have been with us since the inception of the telegraph. But the telegraph and telephone switchboards are two entirely different affairs. The former was a convenient means for uniting any incoming line with any desired instrument, or, once in a while, for connecting two lines for through communication, and required an expert for its manipulation. The latter was designed absolutely for the expeditious establishment of interconnection of any two of a large number of lines, with the ready accomplishment of the several sub-operations involved. The Western Electric Company, in process of time, developed the multiple switchboard.

The multiple switchboard is surely one of the most remarkable advances that have been made in technical telephony; and in many successive forms has maintained its prominent position, from the year 1879, when it first appeared, until the present time; having survived many changes of system, some of which—for instance, that which introduced central energy methods—were of revolutionary character.

When this instrumentality first appeared, it was termed the *'Duplicate Board,'* since it was not supposed that more than two sections of duplicate spring jacks would ever be required. Moreover, the answering of calls and disconnection orders, and the actual switching work were done by different sets of operators, at distinct and differently placed apparatus.

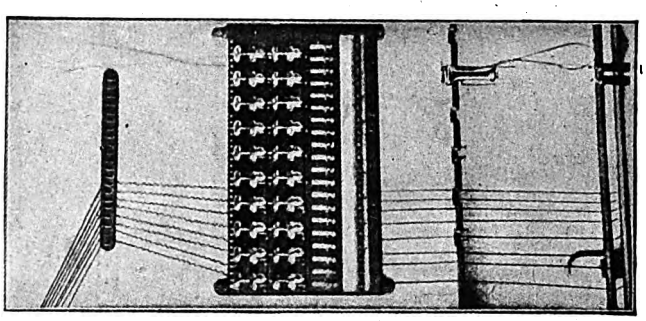
One very noticeable feature of the multiple switchboard is that it was, and is, and will remain, a conglomeration of a great many inventions.

Its division into a large number of sections, each having facilities for answering and supervising a definite number of lines, and also for establishing connection between such lines and all lines entering the station, makes it evident that provision must be made at each section by means of which the operator there can determine before establishing communication with a wanted line whether or not such line is already switched for use at some other section. This, of course, is what we know as the 'busy test.'

THE OPERATION OF THE FIRST MUTIPLE SWITCHBOARD

In the earliest installations of the multiple switchboard, it wasn't a test at all, but merely a visible indication. There was at each section a board with the numbers of all of the lines imprinted on it, placed where it could be seen by all operators, and an operator having switched together any two lines would then hang up a brass disk over each of the two numbers concerned. The other operators were supposed to look at the sign board so decorated, and refrain from connecting with any line thus proclaimed to be busy.

I have referred to the numerous inventions that are combined in the multiple switchboard. About fifteen hundred United States patents have been granted for improvements in such switchboards or important parts thereof, and in apparatus relating to it; and, of these, probably about five hundred are for the varieties of busy test systems. It is this conglomoreate apparatus which, more than any other instrumentality, has made telephone exchange communication on a large scale possible and practical, and, while doing this, it has at the same time operated to improve, cheapen, and quicken the service.



EARLY TELEPHONE SWITCHBOARD.

It has been estimated that by employing the multiple switchboard, a saving of ten seconds for each operation of bringing two substations into communication is well within the facts. This may at first thought be regarded as an insignificant economy, but when we take into account that it is to be multiplied by the number of switch connections effected every day throughout the year, it is insignificant no longer.

A calculation I made some years ago and revised at the close of the year 1916, based upon the daily and yearly number of completed exchange connections made in the Bell system that year, and assuming that one half of the total number were made by means of multiple switchboards, shows that the time saved, for the people of the United States who use the Bell telephone, in a single year, by the availability of the multiple board, reaches the stupendous amount of 511,000 days, or 1,400 years.

To save fourteen centuries in one year is truly an Herculean achievement.

The devising and adaptation of power-driven call generators and special exchange apparatus, as distributing frames, monitors' sets, and like appliances, are all in this class, and have each contributed largely to the gross amount and far-reaching importance of telephonic invention.

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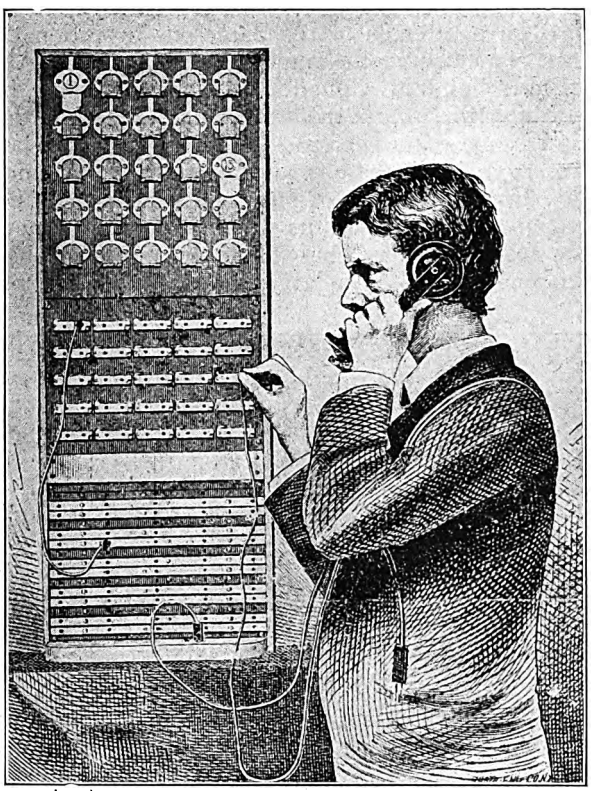
THE INTRODUCTION OF COPPER LINE WIRE

Passing to practical improvements, which more particularly concern the line, it is easily recalled that these include the introduction of copper line wire, the metallic circuit, underground construction generally, the transposition of conductors in loose order, and the modern many conductor cable. Not all



AN EARLY TELEPHONE SWITCHBOARD.

of these in themselves involve invention, but each improvement has invariably suggested and carried in its train a multitude of additions and further improvements, many of them real inventions, without which its full benefit could not have been realized. Thus, copper line wire came into use with the first experimental long distance line, — that built in 1884 between Boston and New York,—and immediately made necessary a new kind of splice or joint and new modes of attachment.

The inductively neutral metallic circuit, though employed in France in the earliest telephone line construction, did not come into extensive use in the United States for exchange work until about the year 1888. The long distance lines had, however, prepared the way for it, by arranging special loops for their terminals. The first exchange switchboard wired on a large scale for metallic circuits was one of 10,000 line capacity, installed at No. 18 Cortland Street, New York. This was originally wired for grounded circuits, but before it went into use, decision was made that the time had arrived for the adoption generally of the metallic circuit principle; and the board had to be re-wired accordingly. But this made a good beginning for the us in the Bell System of the metallic circuit in ex change construction, a use which has become uni versal.

THE GRADUAL USE OF UNDERGROUND

Underground construction came into bein gradually, and experience was gained throug many mistakes in system, conduit material, insula tion, and modes of installing wires. But the terra cotta tile and the 'drawing-in' mode of placing ca bles steadily grew in favor and have become stand ard. In this department of work, invention ha concerned chiefly the construction and arrangemen of manholes, the manner of entering buildings, an the appliances for drawing cables into and out o ducts.

Even before the modern highly improved cabl was perfected, the cable conductors were arrange in twisted pairs. But when long metallic circuit were in the form of pole lines, the application o the twist principle was a problem. But it wa solved by causing the two conductors of each ci cuit to exchange places on the pole cross-arms, a suitable intervals, and by doing this differently i adjacent circuits so that, speaking generally, of an two adjacent circuits, each should have its neutra izing crossings at points substantially midway be tween two crossing points of the other. It is th system of reciprocal neutralization that has becom widely known as "Transposition."

The modern poly-conductor cable is one of th great triumphs, not so much of new invention as o intelligent and persistent development in plan an manufacture. Within the last ten years 1,200 wir was the largest number that could be placed in on cable sheath. But now such a cable may (and of ten does) contain as many as 2,400 wires; all sa isfactorily operable. This wonderful improvemen in cables began with the use of suitable paper as material for the non-conductive separation of th contained wires. The insulation thus compris both the paper itself and the air it holds.

Invention relating to the telephone circuit as whole must not be neglected. While many of i exemplifications are of minor character, a few stan out as being of high and far-reaching consequenc This class of advances includes the invention an general introduction of central energy systems an methods; the advent of the telephone repeater o amplifier; the devising and adoption of means fo the avoidance or mitigation of disturbances accru ing from outside systems of electrical utilizatio protection from destruction or injury due to heav currents or discharges; the development of radi transmission, comprising wireless telephony; an the remarkable work which, including a host o small inventions and some large and importan ones, has lately been accomplished in multiple telephonic and telegraphic transmission, wherel one pair of wires is made available either for fiv simultaneous telephone conversations, for fou simultaneous telegraph messages, or partly for on and partly for the other.

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THE CENTRAL ENERGY SYSTEM

The central energy system, as most of us know, has now been in operation some twenty years. It combines a number of separate inventions, is now in operation in all of the great telephone exchanges of the world, and concerns all of the three classes of operation to which I have adverted, viz.,—talking, switching, and signaling.

It substitutes a central and common source of electrical energy always under the inspection and supervision of experts, and usually consisting of from twelve to twenty storage cells and a dynamo to charge them, for multitudinous local batteries, one at each user's station, which previously were in universal employ.

It comprises: First, a plan for supplying the telephone transmitters of the user's stations with current generated by the common central station battery; and second, a plan for central station call, supervisory and disconnect signals, all automatically operated from the users' stations, but by current from the same central source.

Before this system was introduced, the numerous local batteries at the users' stations required to be constantly watched and regularly renewed, and yet were a prolific cause of compliant. But the central energy system, having enabled these and the magneto generator to be dispensed with, leaves, as the user's station apparatus, only the call bell, the telephone instruments, and the usual automatic suspension switch operated by the removal and replacement of the receiver, from and to its support on the switch lever, and connected to control the main circuit and thus operate the call and other signals by the simple act of removing the receiver from its support for use, and by its replacement at the close of the conversation.

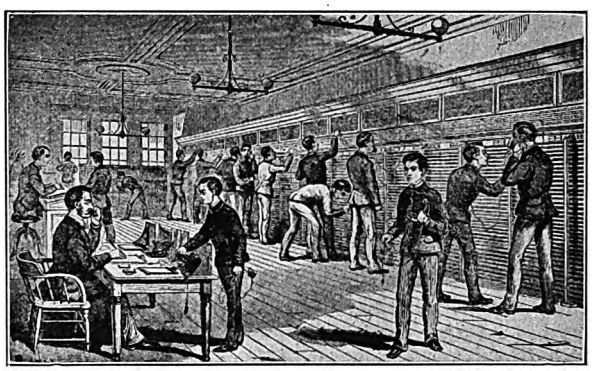
A TIME ECONOMIZER

I have remarked already upon the importance as a time economizer, in establishing switch connections, of the multiple switchboard; and may now add that, by combining with that switchboard the central energy system of apparatus and operation, a further and similar time economy is effected by the facilitation of prompt disconnections.

In regard to amplifiers, I may refer to the fact that the vacuum tube amplifier was preceded by the attainment of a very considerable improvement in the self-suggestive type of receiver-microphone repeater. This instrument aimed at a great reduction of inertia in the moving parts, and reduced the packing of the carbon particles in the transmitting element by dissipating the heat to which it was attributable. This instrument was distinctly serviceable, represented a marked advance over anything of the kind thus far produced, and tended to strongly encourage continued research.

The vacuum tube amplifier is a development of the 'audion' (so-called) of De Forest, and consists of an evacuated glass bulb with three electrodes sealed in it, one of them a filament like that of an incandescent lamp being maintained in a state of glow by an electrical current through it, another formed as a grid, and the third a plate. The input circuit is connected with the filament and grid, and the output or second circuit with the filament and plate.

The grid is maintained negative to the filament in the input circuit leading from the original transmitter, and the filament is negative to the plate in the output circuit leading to the ultimate receiver. The variations from the original transmitter reach the grid and vary its electrical condition and that of the space within the bulb, and thus bring about



INTERIOR OF NEW YORK EXCHANGE IN 1880.

corresponding changes in the output circuit, and these passing over its line act on the receiver at the far station to reproduce the original sounds.

The audion relay is practically a valve device, responsive to the electrical variations produced in the grid; and becomes in fact the *voice* of the second circuit, which having the advantage of a new source of electrical energy operates to carry along the original impulses of the transmitting circuit, maintaing them unchanged in character or form, and, because of the new source of energy, of renewed strength.

Time will not permit me to enlarge upon the advances achieved in other branches of this class; and I must be content with a realization of the circumstances; that I have indicated them, that they are making continued progress, and that in all probability you will, before the winter is over, have speakers familiar specifically with the work done, not only in those branches of research of which I have spoken, but also in others that I have had to leave without discussion, and who, therefore, may be counted upon to deal with them more particularly and authoritatively than I could.

But I think I have sufficiently canvassed the subject in its broader aspects to show beyond question that the telephone industry, and in particular the Bell System, was founded on invention, has grown great by invention, is sustained by invention, and will not cease to expand if and when invention ceases; but will by invention be perpetuated, because the constant study of its technical problems and the invention which is the result of such study must and will also be perpetuated.

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THE MORKRUM PRINTING TELEGRAPH SYSTEM

FULL DESCRIPTION OF OPERATION

Concluding Article.

(*Continued from February 1 issue.*)

[Through error, Figures 42 and 45 were transposed. Figure 42, in the February 1 installment, should be Figure 45. Figure 42 in this, the final installment, is the correct diagram bearing No. 42. Readers who have preserved the papers can make the necessary correction by marking the diagram on page 70, February 1 issue, as Figure 45, giving it the caption: "Layout and Wiring of Duplex Operating Table."]

DUPLEX OPERATION.

Figure 45 shows the layout and wiring of the duplex operating table. In the explanation of the operation of the system, it has been assumed that the operation of the line relay controlled, directly, the operation of the printer and the starting and stopping of the receiver brush. In practice, however, a second relay, known as the printer relay, is used. The line current operates the line relay, which repeats the signals into the printer relay, which relay in turn controls the operation of the selecting magnets and the start magnet of the distributor.

The lever of the sounder switch is connected to the marking contact of the printer relay and when the lever is thrown to the right, it connects the marking contact to the Morse sounder. When the lever is thrown to the left, it connects the marking contact to the solid ring of the receiving commutator of the distributor. The lever of the ground switch is connected to the middle post of the mil-ammeter, so that when it is thrown to the right, it connects this point to ground through 300 ohms. When it is thrown to the left, it connects the middle post of the mil-ammeter to the lever of a switch on the base of the polechanging key. If this latter switch is thrown to the right, the middle post of mil-ammeter is connected to the lever of the key for Morse sending. If it is thrown to the left the connection is made to the solid ring of the transmitting commutator for printer operation. The line switch is a snap switch through which connection is made between the line wire and the set.

Starting the Circuit.—The following routine should be observed in starting the circuit:

1. Center the tongues of the line relay and printer relay.
2. Run test slip locally.
3. Balance.
4. Set distributor speed.
5. Both ends run test slip and set orientation.

Relay Adjustment.—Both the line relay and the printer relay must be adjusted so that when there is no current in the operating coils, the tongue will remain against either contact screw. When a relay is adjusted in this manner, it is said to be "centered". When making this adjustment, the local switch in the panel box must be closed in order to supply current to the armature magnetizing coils of the relays. To center the line relay have the line switch turned off and throw the ground switch to the right. To center the printer relay, raise the tongue of the line relay so that it touches neither contact.

Local Test.—After centering the relays, throw the ground switch to the left and close the line battery knife switch. Turn on the distributor and printer and run a short test slip through the transmitter. This is to make sure that the set is in operating condition before putting it on the line. After running this test, turn the line switch on and throw the sounder switch and the switch on the base of the polechanging key to the right. This will put the set on the line arranged for Morse communication.

Balancing.—For duplex working, the artificial line must approximate, as closely as possible, the line wire in resistance and capacity. To take a balance, which means to adjust the resistance and capacity of the artificial line, both ends must cut in and set the switches for Morse communication. If the home end desires to balance, the distant end should keep his key closed. This will cause the mil-ammeter needle at the home end to be deflected a certain number scale divisions on the marking side. If the artificial line is different from the main line in resistance and capacity, when the home end closes his key, this state of unbalance will be indicated by movement of the mil-ammeter needle. Resistance unbalance is indicated by the needle assuming a new position when the key is closed and resuming its former position when the key is opened. Static unbalance is indicated by a quick throw, or kick, of the needle in one direction and return, when the key is closed and a kick in the opposite direction and return when the key is opened. If the artificial line is unbalanced both as to capacity and resistance, this will be indicated by both a kick and a change of position of the needle

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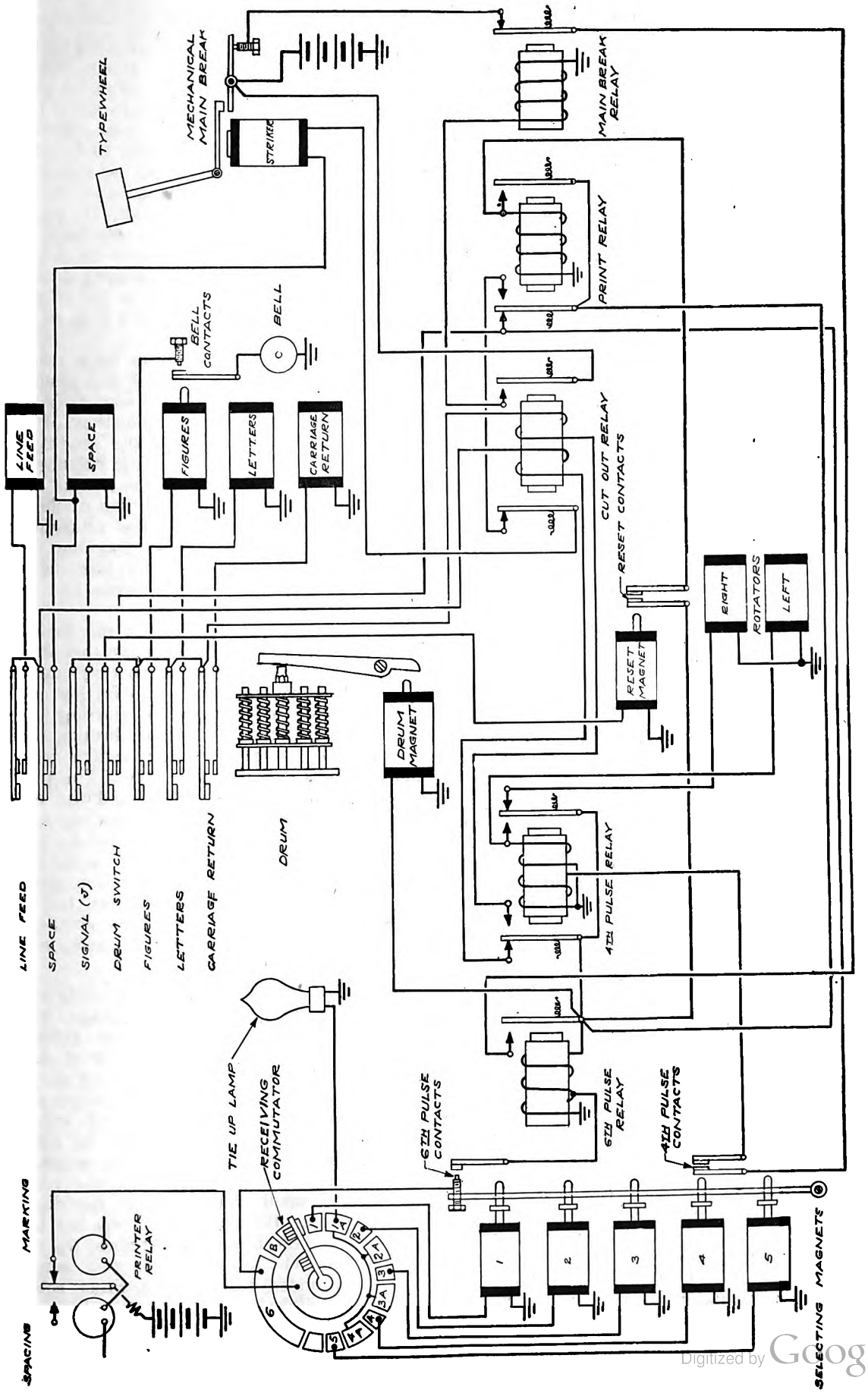

FIGURE 42—LINE RELAY AND PRINTER RELAY CIRCUITS.

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when the home key is closed or opened. In balancing the wire, it is best to secure a resistance balance first, disregarding the effect of static unbalance upon the needle.

Resistance Balance.—To secure a resistance balance, have the distant end keep the Morse key closed and proceed as follows: Note the position of the mil-ammeter when the home key is open. Close the key and note the new position. Then with the key still closed, adjust the rheostat until the needle assumes a position midway between the two positions noted. That is, if the needle deflection, with the key open, is 30 and with the key closed, 34, the rheostat should be adjusted so that the needle will stand at 32 whether the key is open or closed. It will be necessary to close and open

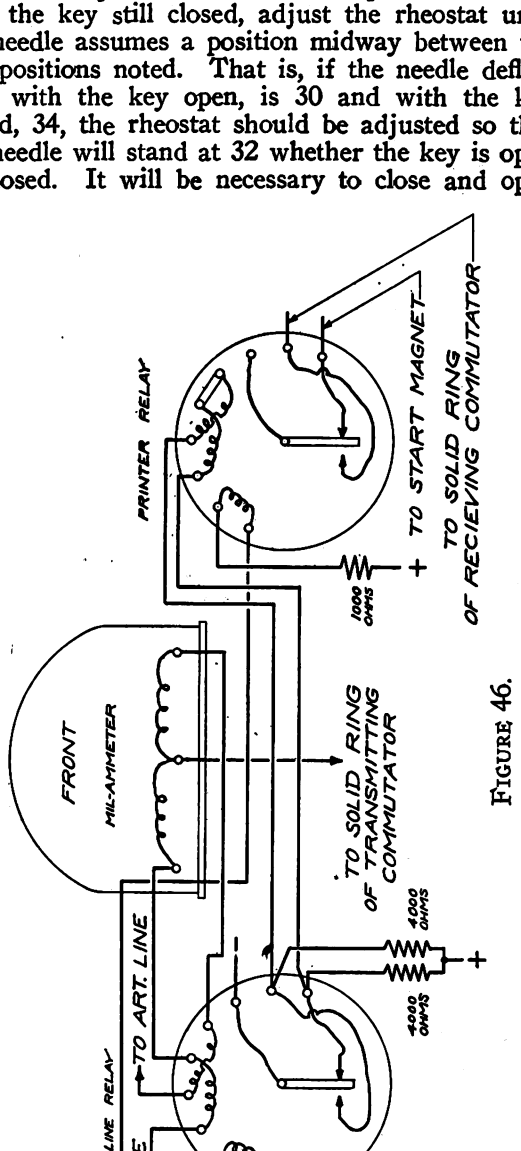

FIGURE 46.

the key several times and refine the adjustment until the needle is not affected by the movement of the home key. When the resistance in the artificial line is too high, the needle will swing in a spacing direction upon closing the key. When the resistance in the artificial line is too low, the needle will swing in a marking direction. After securing a resistance balance, the artificial line condensers should be adjusted to secure a capacity, or static, balance.

Static Balance.—As stated above, static unbalance is manifested by a quick throw or kick of the needle in one direction and return when the key is depressed and a kick in the opposite direction and return when the key is released. In taking a static balance, it is best to disregard the effect upon the needle when the key is opened and observe only the effect when the key is closed. If, upon closing the key, the needle kicks in a *marking* direction *increase* the amount of capacity in the artificial line. If the needle kicks in a *spacing* direction, *decrease* the amount of capacity in the artificial line. The amplitude, or amount, of the kick will indicate the amount of static unbalance.

After the static balance has been rendered as perfect as possible by adjusting the condensers, it can be refined by adjusting the condenser retarding resistances. The static accumulation of the line wire is usually greatest near the sending station. For this reason, in taking a static balance more of the first condenser than of the second should be cut in, and more of the second than of the third, if three condensers are used. The retarding resistances should be arranged so that the first condenser will discharge through the least amount, the second through a greater resistance and the third through the greatest.

It is sometimes desirable, after the static balance has been secured by manipulating the Morse key to send out reversals, or alternating current, and note its effect upon the needle to further adjust the static balance. This is done by starting a piece of tape, punched with the letter R through the transmitter, throwing the transmitter switch to the right and holding down the break key. The distributor of course should be turned on and the switch on the base of the polechanging key thrown to the left. On many wires, the mil-ammeter needle will never stand perfectly still because of induction from neighboring wires. This renders the securing of the static balance somewhat difficult, but the condensers and retarding resistances should be adjusted until the needle shows the least amount of movement.

Patched Wires.—When a line is made up of two or more sections of different gauge wires, the static characteristics are somewhat different and would require a different adjustment of condensers and retarding resistances. If a long section near the sending station is of smaller gauge wire than the distant section, the amount of capacity required in the artificial line would be less and it would be necessary to increase the amount of retarding resistance in series with the condensers. A patch of small gauge wire at the distant end would increase the amount of capacity necessary to secure a static balance and reduce the retarding resistances. The introduction of a considerable amount of added resistance in either end of the main line will reduce the amount of capacity required for a balance at that end and increase it at

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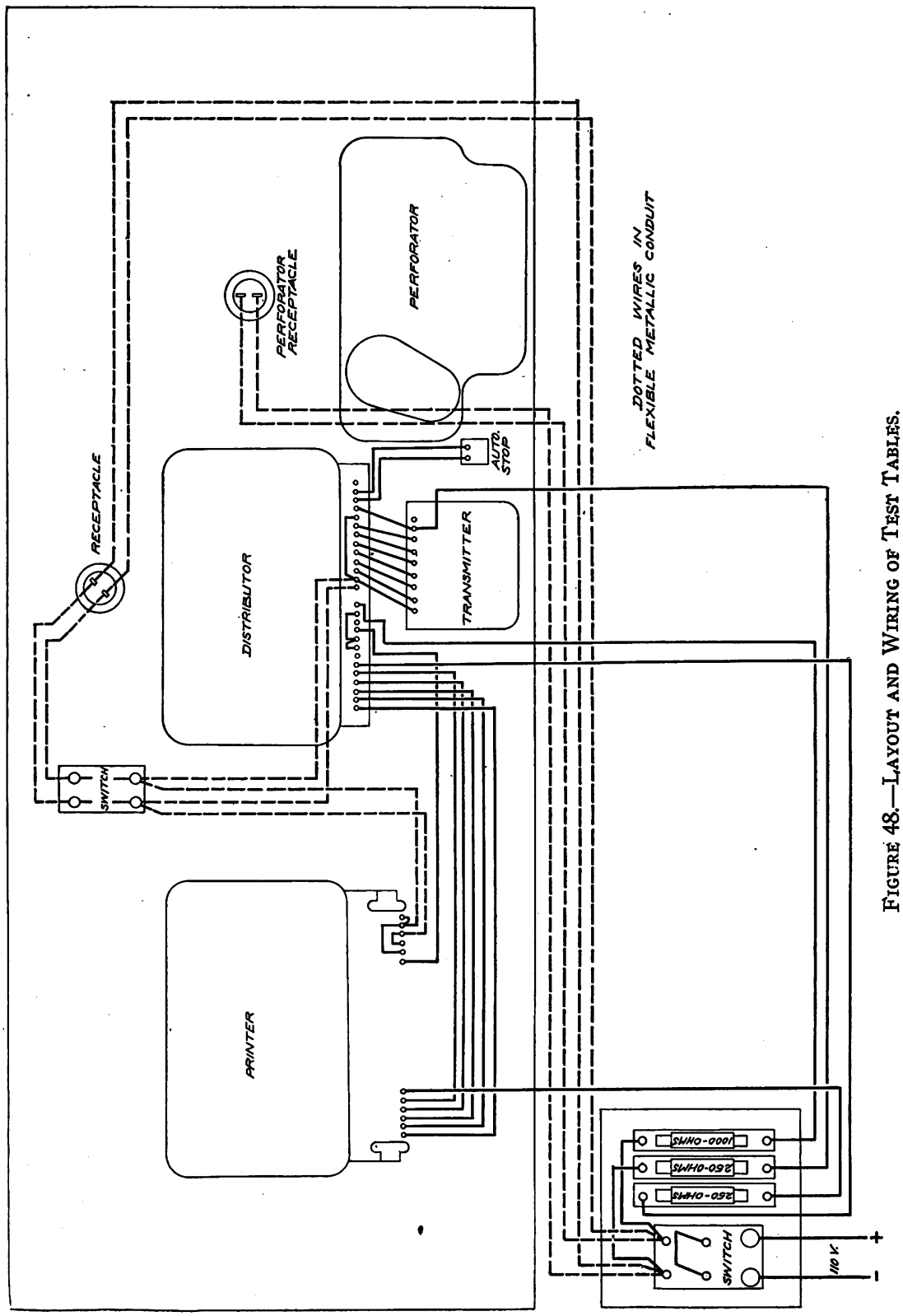

FIGURE 48.—LAYOUT AND WIRING OF TEST TABLES.

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the other end. For this reason, whenever it is necessary to put added resistance in the main line, an equal amount should be inserted at either end.

After each station has secured a satisfactory balance, all lever switches should be thrown to the left for printer operation.

Speed Adjustment.—It should be previously determined that one station shall set his distributor at a fixed speed while the other station will adjust to meet it. The station which is not adjusting speed should throw the stop lever on the transmitter to "stop" so that spacing, or blank signals will be sent over the line. The station which is to adjust should set the governor spring adjusting screw so that the spring lever (Figure 47) is approximately horizontal. He should then regulate the contact adjusting screw until the distributor stays in step. When the distributor is not in step, various characters will be printed by the receiving printer. When the distributor is in step the printer will remain silent.

After the distributor is gotten in step by means of the contact screw, the limiting positions of this screw should be determined. This is done by turning the screw to the left until the distributor goes out of step and turning it back slightly to just bring it in step and noting the position. It should then be turned in the opposite direction and the opposite limit determined, after which the screw should be set midway between these two limits.

With the contact screw in its mid-position the same procedure should be followed in determining the mid-position of the spring adjusting screw and the screw set in that position. After this adjustment the distributors at either end of the line will be running at approximately the same speed. There should be about three and one half turns range of adjustment of the spring adjusting screw.

For the type of distributor equipped with the synchronizing lamp, the method of setting the speed is much simpler. The station which is adjusting speed should request the distant end to send reversals, or "A. C.," which is done by sending the letter R and holding down the break key. This should cause the mil-ammeter needle to vibrate at zero. He should then turn off the printer and press the lamp button, located at the left front corner of the distributor base. This will cause the synchronizing lamp to light and illuminate the synchronizing disc attached to the hub of the transmitter shaft gear. This disc is divided into eight segments, four red and four white. As the lamp is connected to the spacing contact of the printer relay and the distant end is sending out four reversals per revolution, the lamp will receive current every time the printer relay touches its spacing contact, or four times per revolution of the distant distributor. The light of this lamp, illuminating the red and white disc, will cause the disc to appear stationary if the home distributor is running at the same speed as the distant distributor. If the home distributor is running faster, the disc will seem to revolve in a clockwise direction. If the home distributor is running slower than the distant one, the disc will seem to revolve counter-clockwise. The governor screws should be adjusted, using the contact screw to secure large speed changes and the spring screw for small speed changes, until the disc appears to stand still. The two distributors at either end of the line will then be running at exactly the same speed, which is the best operating condition.

Orientation.—Setting the receiving commutator in the most favorable position for the reception of signals is known as orientation. To orient the receiving commutator, have the distant end transmit a long tape, perforated with RY. By means of the thumb wheel located just below the receiving commutator, rotate the commutator until the receiving printer does not print the letters correctly and bring it back just far enough to secure correct printing and note the position with reference to the graduated scale fastened to the inner side of the distributor end casting near the top. Rotate the commutator in the opposite direction and find the other limit on the scale and then set the commutator midway between these two limits.

After both ends have balanced, the speed has been set and orientation has been secured at both ends, the circuit is ready for operation.

Test Set.—The test set is provided for testing and adjusting the various units. No line battery or polar relay is required for this set. The marking contacts of the transmitter are connected to one side of the local battery and this battery flows through those tongues which are against their

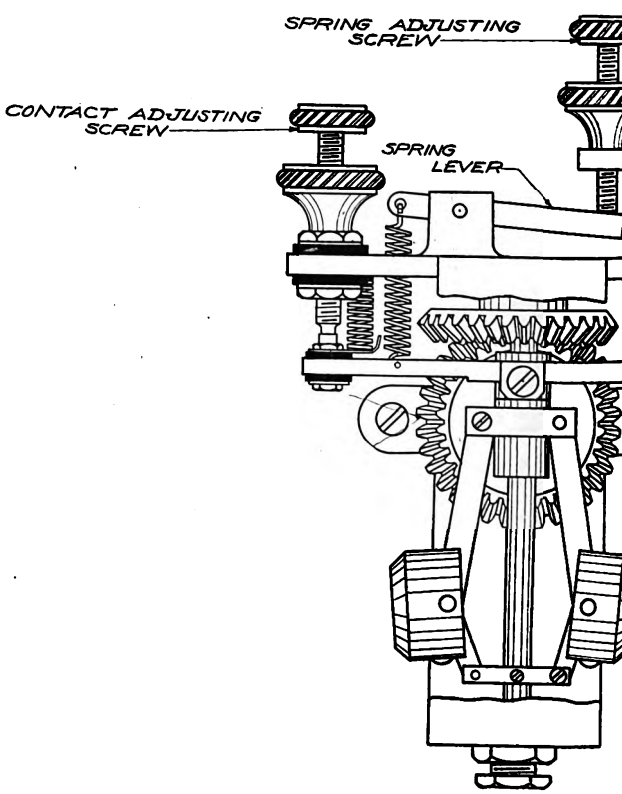

FIGURE 47.—MOTOR GOVERNOR.

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marking contacts to the corresponding segments of the transmitting commutator of the distributor. As the transmitter brush revolves, the battery flows through the solid transmitting ring to the solid ring of the receiving commutator and thence through the brush and selecting segments to any of the selecting magnets of the printer. For the operation of the sixth pulse relay, the top segment of the transmitting commutator is connected to battery so that when the brush passes over this segment, battery flows to the receiver brush and the sixth pulse segment of the receiving commutator. To operate the starting magnet of the distributor, the proper pole of local battery is connected to the starting segment of the transmitting commutator and whenever the transmitter brush passes over this segment, the starting magnet is operated.

The Boy and The Wire.

The messenger boy is, and has been from the beginning, so much a part of the telegraph business that in picture and in story he has occupied a conspicuous and a romantic place, second only to that of the wonder-working wire itself.

In all parts of the civilized world neatly uniformed telegraph messengers are everywhere in evidence—dotting the landscape of commercial activity. Although in the large cities there are thousands of messengers, they are seldom seen in pairs—each one is an independent agency, flitting hither and yon on someone else's errand.

The telegraph business is unique among professions in that the majority of those who have reached high positions in the service began as messenger boys. The telegraph official who in his youth worked as a messenger, in spare moments learned to operate a Morse key, and who thenceforth progressed through the various grades of the service acquired an education based on first hand knowledge. In the traffic and commercial departments of a telegraph organization this is the kind of knowledge that has the greatest value.

That so many of the chief operators, office managers, and officials have graduated from the messenger ranks has assured to the messenger boys of any given period a degree of interest and sympathetic treatment not common in other lines of work.

A large telegraph company comes as near being an international enterprise as a commercial undertaking can be. A steamship company may sail ships from a port in one country to a port in another country, but a ship can be in only one country at a time, or it is on the high seas. The physical links of communication, the property of a telegraph company, are not so limited.

A telegraph company has in its service at all times, and stationed in offices in their native countries: Americans, Canadians, Englishmen, Mexicans, Cubans, and various other nationals. This is true of the messenger forces as well as of other employees, and it does not require more than ordinary imagination to picture in the mind a dusky lad in Cuba, clad in a white duck suit, bringing to the telegraph office a telegram which an hour later is delivered in Winnipeg, Man., by a lad wearing moccasins and with a fur cap pulled over his ears.

In the United States, on any day in the month of February telegrams are delivered by boys on horseback, on snowshoes, on bicycles, on motorcycles, on roller skates, on ice skates, in automobiles, in canoes, in moccasins, in tennis shoes, in sandals, and in some of the smaller villages in the South, barefooted boys deliver the ever important telegram—all of these outfits used in one day somewhere in our own country.

From the "international" viewpoint, also, we know that in Boston, Timmy Dolan; in New York, Toni Caruso; in Milwaukee, Hans Shultz; in Minneapolis, Hans Swanson; in New Orleans, Poly Levine; and in odd places in California, Lee Wong, wear the telegraph company's uniform and generally remember to ask, in fair American, "Any answer?"

Along the United States-Mexico border managers of telegraph offices on our side of the line have, among their most dependable messengers, Mexican boys who believe the opportunities north of the Rio Grande are more promising than in Mexico.

The illustration presented herewith shows Dave Gochicot employed as messenger by the Western Union Telegraph Company at Pecos, Tex. Dave admits Mexican parentage, but maintains that he himself is "100 per cent. United States." Dave has a record of one hundred telegrams delivered per day, and judging from the neat condition of his uniform and of his mount we should say that he could well be cited as a model messenger boy, a credit to himself and to the manager of the office at Pecos.

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WALTER P. PHILLIPS.
An Appreciation.

By Donald McNicol.

In view of the spirit of unrest which today appears to prevail in our country, as well as in other countries, the passing of an honored citizen presents an appropriate occasion for a brief biographical review which may bring to us new faith in the future—a renewed faith in human power to set things right.

The nineteenth century was particularly fertile in the production of a type of citizen who achieved great and good ends by virtue of individual leadership; the sort of leadership which drew strength from personal worth and personal example rather than from the incitement of mass interest against imaginary juggernauts.

The nineteenth century gave us a line of publicists, poets, men of science, and patriots who for all time shall represent in history America at its best. The names of Abraham Lincoln, Horace Greeley, Joseph Henry, Daniel Webster, Henry W. Longfellow, and others fresh in memory, shall live through the ages as reminders of the days during which great characters were forged in the open; not in underground halls of impotent discontent.

In our sphere of usefulness—the telegraph business—Walter P. Phillips arrived at a time when a man of his vision and intellectual powers was needed. Every great enterprise, every great art is more successful, more complete, when there is identified with it a leader possessing a personality above the ordinary run of mankind. In the infancy of the telegraph the pioneers had as an inspiration the kindly and helpful genius who was James D. Reid. In personal prominence and popularity, Walter Phillips was the successor of Mr. Reid, and that place he retained over a period of forty years, until advancing age forced his retirement from business.

Students of folklore tell us that the beautiful spirit of Christmas was practically nonexistent in England until Charles Dickens wrote the "Christmas Carol." Dickens continued writing about the spirit of Christmas until Englishmen, in the course of time, came to believe that it had always existed, and thenceforth the Yuletide came into its own; reaching its greatest heights of human blessedness during the Victorian era.

Walter P. Phillips, in his early telegraph experience, conceived the idea of creating a spirit of *camaraderie* and goodfellowship among telegraphers. Under the pen name of "John Oakum" he wrote stories by the score, employing as characters and heroes telegraph operators who loved their art and who were loyal to their friends and coworkers. As he viewed the realities, on all sides in evidence, he must have at times felt discouragement; but, like Dickens, he persisted in eulogizing the telegraph and the telegrapher until, ultimately, the men of the key came to believe that they were pretty good fellows; regarding it as traditional that the craft formed a social and professional entity worthy of inspiring pride.

The creation of the spirit of goodfellowship of the wire—the romance of a great art—was Walter Phillips' greatest work.

In what may be termed the more practical and tangible achievements of a busy life he was also a widely recognized success.

In the year 1874, he entered the service of the Associated Press, and within a year rose to be assistant general manager. In 1877, he was sent to Washington as manager at that point where he distinguished himself in many ways, particularly in his efforts to have the Red Cross treaty adopted. He became associated with Clara Barton and for twenty years was the general secretary of the Red Cross, ably seconding and supplementing that noble woman's work.

He had the confidence and friendship of Prof. Samuel Finley Breese Morse, the inventor of the telegraph; Generals Hayes, Garfield, Arthur, Sherman, and Sheridan; of James G. Blaine, Robert G. Ingersoll, Henry George; Presidents Cleveland and Harrison; George W. Childs, Charles A. Dana, Witelaw Reid, General John B. Gordon, Jay Gould, John W. Mackay, William Winter, Richard Mansfield, Eugene Field, James Whitcomb Riley, Thomas Bailey Aldrich, Samuel L. Clemens and many others of varied political and religious faiths.

In 1882, Mr Phillips became general manager of the United Press, with headquarters in New York. This organization was merged with the Associated Press in 1897. He was prominently identified with the Columbia Graphophone Company, in whose service he continued for upward of fifteen years. At the time of his death he was the only surviving 1877 member of the Lotos Club of New York of which he had been a director and secretary. He was a member of the Sun Alumni Association, having "worked with Dana on the New York *Sun*" forty-seven years ago—1872-73, and he was prominent for many years in Y. M. C. A., Sunshine Mission and Shut-in Society work.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

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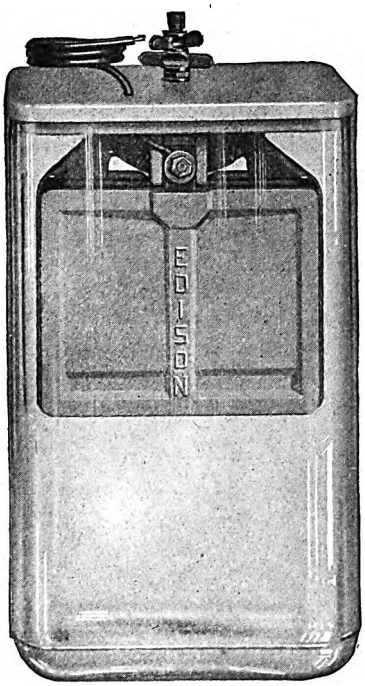

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THE RAILROAD
TELEGRAPH AND TELEPHONE

American Railroad Association, Telegraph and Telephone Division.

Chairman J. F. Caskey of the Telegraph and Telephone Division, American Railroad Association, advises that:

"In order to conserve the best interests of the Telegraph and Telephone Division, the Committee of Direction has decided that it is not advisable to hold a Spring Session of the Division.

"Notice is given, therefore, that the Spring Session scheduled for March 30 and 31, and April 1, 1920, of the Telegraph and Telephone Division will not be held.

"The Fall Session (annual meeting) of the Division will convene on September 22, 23 and 24, 1920. Formal notice relative to the session will be issued later."

Canadian National Railways.

H. A. DELANEY, returned from military duty, has been appointed train dispatcher at Edmundston.

W. P. HUTCHINSON, dispatcher, has returned from St. Louis, Mo., where he attended the train dispatchers' convention.

L. J. BLAKE, returned from military duty, has been appointed operator at Hillsboro.

L. N. CORON, has been appointed operator at St. Romaul.

J. E. DUBE, has been appointed operator at Levis, Que., being transferred from Lake Baker.

J. B. GAGNON, of Montreal office, has been transferred to Rimouski, Que., as operator.

J. E. BOULANGER, has been appointed operator at Chaudiere Junction.

OPERATORS stationed at points where maple sugar groves are handy are planning to reap a harvest due to the high prices being paid for sugar. Tapping the trees, collecting and boiling the sap constitutes a healthy and profitable occupation for off-hours.

Canadian Pacific Railway Telegraph Messenger Boys Entertained.

On Saturday evening, January 17, one hundred and twenty Canadian Pacific Railway Telegraph messengers were entertained in the cafeteria and rooms of Windsor station, Montreal, by J McMillan, manager of telegraphs.

During the entertainment music and singing was furnished for the edification of the future captains of industry. J. Manson, assistant to the vice-president, delivered an inspiring talk to the boys, concluding his remarks by announcing a prize of five dollars to the boy present who was the best singer, and a prize of five dollars to the boy who could make the best speech. Immediately several entries were made in each contest, and by close decisions B. Resnick was awarded the musical honors, and Samuel Rosenberg collected the money awarded to the most gifted speaker.

After dinner was served an entertainment was put on in which the messengers were the chief performers. Miss McAuley, of the telephone department acted as accompanist for the vocal contributors.

Moving pictures were shown depicting scenes along the main line of the Canadian Pacific Railroad, interspersed with a comedy or two.

Grant Hall, vice-president of the railroad company, arrived after the pictures had been shown and gave the boys an excellent talk; pointing out particularly that many of the higher officials of the company were messenger boys in their youth. Learning of the nature of the previous contests Mr. Hall offered a prize to the boy who could, on the spot, prove himself the best acrobat present. After several tryouts, L. Bouchard was awarded the belt.

The dinner arrangements were carried out by Mr. Boyker, under the immediate direction of W. A. Cooper, manager of the dining car department. At the head table were seated John McMillan, manager of telegraphs; W. J. Camp, assistant manager of telegraphs; W. M. Thompson, superintendent; R. Murray, chief of staff; G. W. Bancroft, agent; C. W. Graham, assistant agent, and Messrs. Garden and Brown of the city department.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa

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QUESTIONS AND ANSWERS

Selenium Cells.

A. M. J.—The Dixon system of ocean cable signaling uses selenium cells; also, there are many interesting applications of these light-sensitive cells which may be demonstrated with apparatus which all experimenters have at hand. There has recently been issued a book entitled "Selenium Cells, and How They Are Made." The book sells for one dollar, and for this amount we can send you a copy.

Radio Apparatus Costs.

J. H. J.—A single stage audion receiving set produces about twenty times the applied signal intensity. A two-stage amplifier produces a signal of about 350 times the intensity of that possible by connecting the telephone receivers directly to the audion. High grade amateur amplifier sets can now be purchased for $35.00. A two-stage amplifier can be purchased for $42.50. Baldwin type telephone receivers with mica diaphragms cost $18.00 per set, but a good pair of telephones can be purchased for $10.00 or $12.00.

Telephone Between Moving Trains.

T. L. G.—Two different systems of telephoning between moving trains, and between stations and moving trains, using track rails as conductors, have been tried out during the past year or two. Tests conducted a month ago on the Philadelphia and Reading Railroad were partly successful. It is understood that the apparatus is now being improved to overcome difficulties developed during the tests.

Insulators.

R. A. S.—Pure water has a resistance eight-tenths that of air. Beeswax, ebonite, dry paper, paraffine, and para rubber a resistance twice that of air. Common glass, gutta-percha, impregnated paper, and shellac, a resistance three times that of air. Mica and porcelain, a resistance four times that of air. Vulcanized rubber compounds have a resistance six times that of air; heavy flint glass a resistance ten times that of air. These figures assume equal cross-section of materials and air; the air at ordinary pressure.

The dielectric strength of air at atmospheric pressure lies between 38,000 and 39,000 volts per centimeter.

The "Postal" and Printers.

W. E. M.—The Postal Telegraph-Cable Company does not now use printing telegraphs of any system. All of the company's message traffic is handled by means of single line, duplex, and quadruplex Morse operation.

The company in 1907 and 1908 had a number of circuits equipped with the Rowland printing telegraph apparatus, following that the Wright printer was used on three or four circuits out of New York, and a circuit between Chicago and St. Louis. Beginning in 1910, and until a year or so ago, the company used the Morkrum duplex printer. At the time this service was discontinued the company had about a dozen Morkrum circuits.

The Telautograph.

M. W. T.—The telautograph is an instrument by which messages written at one station in handwriting are reproduced in the same form by electrical means at another, or several other stations. The reproduced record is made at the same time the original message is written, the main characteristics of the original being reproduced.

The instrument operates on the well-known principle of the direct-current voltmeter. The magnetic field is electrically produced, and two variable currents controlled by the transmitter are used to actuate two moving coils in the receiver, which, in turn, impart to a pen, or pencil, the movements made by the stylus in the hand of the transmitting operator. The device has many useful applications for establishing communication over short distances.

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SHOP TALK.

BY THE OBSERVER.

Circuits Carrying Automatic Signals.

Continuing the subject of our talk in the January 16 issue of TELEGRAPH AND TELEPHONE AGE, it is desired here to call attention to the fact that the circulars received from headquarters will accomplish good only when they are studied from the right viewpoint. At times a difference of opinion may exist as to the intended interpretation, but as the majority of the men in charge of repeaters on important trunk circuits have had long experience, improvement will take place when printed instructions are given the benefit of open-minded consideration.

However, avoiding generalities, let us consider a typical daily experience on the job with the circuits. It happens sometimes that a circuit running, say, from North A to South E, is being watched for a scrape—"A" running reversals. "B" may say "O.K. by me," while "D" says "North." "C" may then remark "I don't see it."

Now, then, had C had his undulator connected in the North leak he would not have any difficulty in "seeing" it. Too many attendants have gotten in the habit of listening to the signals as produced by the sounder, or watching the movements of the meter needle.

Now, although a long experienced Morse chief can detect and identify certain irregularities by the action of a sounder or of a meter needle, the fact remains that the modern way to spot a troublesome "hang" (troublesome, because it comes in and goes out quickly) is by means of the undulator. The undulator record leaves nothing to guesswork or opinion.

In a case like the one above mentioned, the attendant at A would, no doubt, request the man at C to "clean up," and forthwith would follow a debate by wire in case C knew his points were clean.

These arguments occur too frequently, and inasmuch as the ideas exchanged are likely to be uncomplimentary, the argument lasts too long. So long, in fact, that business from both terminal offices is delayed longer than it should be due to such a cause. The thought should be always in mind to reduce to a minimum the length of time a circuit is idle due to repeater trouble.

Selector Failure.

After an attendant has given OK to A's alternating current signals, and "E" is unable to ring in the terminal station beyond your office, you can save time by carefully making the selector code call for the office whose attention is desired. There is a possibility that the selector may be hung up on one side. Inasmuch as you must remain at the set until the trouble is remedied, no matter at what point it may be, you are wisely employed when you are aiding in ringing in the desired office. Service performance of this kind makes a man feel better when his tour of duty is over.

Should it be necessary to use some other means or some other route to bring in the selectored office, that office should state whether the delay was due to selector failure or to the fact that he was engaged in other work of equal importance. If the selector was at fault, the trouble should be immediately remedied and the other terminal offices so advised. It is imperative that all offices should have confidence in the selectors at other stations, and this is possible when inoperative selectors are so bulletined and their repair likewise announced.

A pretty good motto for these progressive days is: "The best we can do is none too good."

Telegraphs and Telephones in Camaguey, Cuba.

The Province of Camaguey (formerly Puerto Principe), which forms the Nuevitas consular district, is the second in size of the six provinces of Cuba, having an area of about 10,190 square miles. It is, however, the most thinly populated of them all. According to the 1907 census it ranked sixth in population, with 118,000 people, of whom 91.3 per cent were Cubans, 7.1 per cent Spaniards, and 1.6 per cent of other nationalities.

The telegraph lines are owned and operated by the government in connection with the postal service. The rates are based on the number of provinces crossed by the message, being, for instance, 2 cents a word (counting address and signature) for towns within the province or in the adjoining province, and 3 cents a word on messages destined for Havana or towns at a similar distance. Except at Camaguey, telegraph offices are not open at night, the one at Nuevitas closing at 10 p. m.

There are no cable offices in the district, cablegrams being routed either by Cienfuegos or Havana. To the cable toll a charge of 4 cents a word for the land service is added. There are no wireless stations in the district at present, except a small one operated by United States Marines now stationed at Camaguey.

The Cuban Telephone Co. of Havana has lines in the province so it is possible to make long-distance calls from Nuevitas and other points to the cities of the island. This company has also a local city service at Camaguey and at Ciego de Avila. At Nuevitas there is a local telephone system, just put into operation.

Central Telegraph Office, London, England.

EMERGENCY OFFICE AVAILABLE DURING AIR RAIDS.

It may be of interest to state that over one hundred circuits were extended during air raids by means of a rotary switch to an emergency telegraph office in the basement of King Edward's Building. The operators sought shelter in this basement and "carried on" within a few minutes of an air raid warning being received. The dismantling of the office is now nearly completed.

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F. A. MOHR,

Acting General Manager, Gulf Division, Western Union Telegraph Company, Dallas, Tex.

As announced in our February 1 issue, F. A. Mohr has been appointed acting general manager of the Gulf Division, Western Union Telegraph Company, Dallas, Tex., succeeding the late S. M. English.

Mr. Mohr is of the type of men who are a credit to the telegraph business. By this we mean the men who have stuck to the telegraph over a long period of years without ever getting into a rut, but rather have employed their talents to improve the service to the public, better the relations between company and employee and who have as a result of these personal attributes progressed upward through the ranks from messenger boy to general manager.

In the year 1890, Mr. Mohr was employed as messenger boy in the Racine, Wis., office of the company, and there learned to telegraph and to

F. A. MOHR.

handle the clerical end of the business. In 1902 he was transferred to Chicago, and during the following four years served as manager and operator at various important branch offices under A. C. Murphy, superintendent of city lines. During the World's Fair at Chicago, Mr. Mohr had charge of the Woodlawn branch office, which handled the hotel telegraph business of the Fair.

In 1896 he was appointed manager at Jacksonville, Ill., where he remained two years, going from there to Cairo, Ill., in the same capacity. After six months at Cairo he was transferred to Davenport, Iowa, and two years later was appointed manager at Milwaukee, Wis.

Mr. Mohr continued as manager at Milwaukee until 1918 when he was appointed city superintendent at St. Louis, Mo., from which position he was advanced to the position he now holds at Dallas.

As a result of close observation of conditions in the telegraph service extending over a period of thirty years, Mr. Mohr has realized that the greatest asset a telegraph official can have to aid him in his work is the confidence and cooperation of his associates and fellow employees.

In the extensive Gulf Division Mr. Mohr will have a promising field for the exercise of the principles which have made a success of his administration of other districts.

Telegraph Inventors Have Difficulties.

In the Congressional Record for January 28, 1920, is printed a speech delivered by Senator New, of Indiana, in which he said:

"We look upon men today who are predicting great things for the future of aeronautics as dreamers. Perhaps they are. But within the lifetime of men who are now not only living, but Members of this Congress, Gov. Wallace, of Indiana, was defeated for reelection to membership in the House of Representatives because he voted $30,000 of the people's money for the establishment of a telegraph line between Washington and Baltimore, classed as a crazy project, a visionary scheme; and because he did that Wallace was actually defeated. Mr. Cannon told the story on the floor of the House not long ago of having heard Wallace's opponent, William J. Brown, attack him in a speech for having voted for the appropriation; and that was the one thing that brought about his defeat at the hands of Brown.

"It is true that a citizen of Washington as long ago as 1866, not only practically invented wireless telegraphy, but succeeded in transmitting a message a distance of 18 miles within sight of the dome of this Capitol, and nothing ever came of it, because he could not get financial backing. Charles Sumner made a speech on this floor in which he told of what that man had done, but he did it in an apologetic sort of way, and showed that Mr. Sumner himself had no faith in any future for wireless communication.

"The Government made no appropriation. That man's name was Loomis. He lived here in Washington and he took out a patent on his invention. But it was not until 1897, I believe, 30 years later, that Marconi succeeded in sending a radiogram half that distance in England. The moment was ripe for it, he got backing, the thing went ahead, and today you have the wireless."

Not After July 1, 1919.

The telegram which was delivered reading "Will you take little jags for a week," and which, of course, should have referred to "little James" could hardly be charged against the mux department.

ON A SOUND BASIS: The Morse alphabet.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL.

E. F. HOWELL, JR., has been appointed acting secretary of the Serial Building Loan and Savings Institution, New York, succeeding his father, the late E. F. Howell.

LIEUT. COL. HERBERT E. SHREEVE, in charge, during the late war of the division of research and inspection, United States Signal Corps, with headquarters in Paris, France, and now head of the transmission department, Western Electric Company, New York, has been made a *Chevalier De La Legion D'Honneur,* of France.

W. E. HARKNESS, formerly telephone engineer in the service of the Western Electric Company, and the Hall Switch and Signal Company, and now in engineering work in Chicago, was a New York visitor on January 23.

J. B. THOMPSON, of the office of C. E. Davies, superintendent of traffic, Great North Western Telegraph Company, Toronto, Ont., is stationed in New York for a few weeks, familiarizing himself with up-to-date methods of telegraph traffic handling.

GEORGE PHEMISTER, manager of the Great North Western Telegraph Company's office at Niagara Falls, Ont., in the recent city elections was re-elected school trustee over a Socialist candidate who had a large following.

W. H. WINTER, general superintendent of plant, Bell Telephone Company of Canada, was a New York business visitor January 15 to 21.

STERLING MORTON, president of the Morkrum Company, Chicago, was a New York visitor on January 30.

MISS FLORENCE J. TALTAVALL, daughter of J. B. Taltavall, publisher of TELEGRAPH AND TELEPHONE AGE, was married to J. Whitby Foard, of the International Western Electric Company, New York, on January 31.

MISS GERTRUDE GRIFFITH, daughter of E. P. Griffith, superintendent of telegraph, Erie Railroad Company, New York, was married to Glade Scollard Button, traffic department, Western Union Telegraph Company, New York, on January 31.

THE CABLE.

Pacific Cable Staff at San Francisco.

The staff of the Commercial Pacific Cable Company at San Francisco consists of E. Desnouee, superintendent; H. Taylor, senior supervisor; T. Mullahey, junior supervisor; A. G. Paget, D. L. Stuart, and G. B. Perry, senior operators; M. Hardy, mechanician, and George Scott, assistant mechanician. Among the expert cable operators employed at this station are E. Tilford, A. P. Allan, I. Rolley, R. Hunter, E. Combie, W. Sullivan, C. Pitko and H. Young.

Messrs. A. G. Paget, senior operator, and H. Young, operator, leave shortly for the station at Guam, where Mr. Paget will be supervisor.

Restoration of Cables Between Great Britain and Germany.

It was decided in July last to reopen telegraphic communication with Germany, and the new cable ship *Monarch* started repair work in the North Sea on the Bacton-Borkum cables during the early part of August.

Faults were cleared on Bacton No. 1 cable and working commenced on August 23. The *Monarch* commenced the repair of Bacton No. 2 cable early in September and on the Mundesley-Nordeney cable in the middle of the same month.

The repair of these three cables has provided eleven workable wires to Germany. One wire in Bacton No. 2 cable, however, is faulty and unworkable; and two of the wires in Bacton No. 1 are also faulty, though workable with simplex Hughes apparatus. There thus remain for repair, when other work permits, the following Anglo-German cables: Bacton-Borkum No. 3, Lowestoft-Nordeney and Lowestoft-Borkum, each of which has four conductors.

During the war the repeater station at North-Walsham had been dismantled of all repeating apparatus for use in other spheres, and it was decided at the end of July to re-equip the station on the pre-war basis. Steps were taken accordingly, and the station was ready for work in time for the reopening of telegraphic communication with Germany.

It was found necessary to replace several of the

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secondary cells and some of the wiring had also to be renewed, but on the whole the condition of the equipment that had been left *in situ* was good.

RADIO TELEGRAPHY.

Radio Corporation Notes.

E. J. NALLY, president, has returned from the Pacific Coast. He reports salubrious weather in Southern California.

JOHN SHEA, formerly manager of the Commercial Cable office in the Herald Building, New York, has joined the ranks of the Radio Corporation and is engaged in the work of the commercial department. Mr. Shea served two years, during the war, in the United States Cable Censors Department as officer in charge of the commercial field station.

JOHN B. ROSTRON, for 22 years in the service of the Commercial Cable Company, has entered the service of the Radio Corporation as assistant traffic manager.

MISS FRIEDA A. GROSSE, of the stenographic department, was married February 11 to Mr. Walter Sittman, both of Brooklyn.

CARL ORT, of the research department, died February 1, after a brief illness of pneumonia at the early age of 35. He was unmarried and a native of Czechoslovakia.

AT BELMAR, N. J., high power radio station, employees of the Radio Corporation of America have formed the Belmarconi Club, an organization to promote the social welfare of the large number of employees located at that station.

A SPECIAL WIRELESS SERVICE between England and Italy for the use of the press was opened on January 6, by the Marconi Company. The service was authorized by the Italian government and the British Post Office. The Marconi high power station at Carnarvon is used in England, and three hours daily have been allotted for this traffic.

ICE-COATED WIRES have for three-quarters of a century brought annual winter difficulties to land line telegraph systems, and experience during the month of January at the big radio station at Annapolis, Md., demonstrated that wireless stations having extensive antennas are subject to troubles of the same nature. On January 23 it was found necessary to employ a forty-foot captive balloon to carry up workmen to clear the ice which had accumulated on the aerial wires supported by the four towers.

THE BOY VISITOR from the south who beheld a New York traffic policeman wearing a pair of black ear-muffs was perhaps justified in approaching the big fellow and inquiring: "Who do you get?" But when the cop replied: "I get the speeders," the radio amateur could only say, while making for the curb: "Gee, he must have a first-grade license."

AMATEUR RADIO ENTHUSIASTS have at last been exonerated in their claims that they have at times received signals from stations "more than thirty-five thousand miles away." It appears that odd squibs have been received at certain large commercial radio stations which Mr. Marconi and other famous radio experts state may possibly have originated at stations on Mars or Venus. The boys may not have been so far astray in their geography after all.

American Legion Radio Post Formed.

Plans are under way to form a Radio Post of the American Legion. Among the organizers of the post are Edgar H. Felix, W. T. Weatherbee, J. E. Howay, Donald D. Way and Harry A. Burgess.

Wireless Communication Between United States and Sweden.

[*Cablegram from American Minister Ira Nelson Morris, Stockholm.*]

There has been a movement in Sweden for some time past for the erection of a wireless station which will be powerful enough to communicate with the world at large and with the United States particularly. Lately this project has taken on a very definite shape, and the Swedish High Commissioner, Mr. Axel Robert Nordvall, who was in Washington at the time of the war, is at the head of its promotion. The details have already been worked out and the whole matter handed to the government of Sweden, which it is understood will present a request to the Swedish parliament for the appropriation of $2,500,000 to be used in the erection of this wireless station. However, when the bill is presented to the parliament the promoters are very anxious to have from the United States assurances that some definite hours every day will be assigned to the Swedish wireless station for sending messages to and also receiving messages from powerful wireless station or stations in America.

The Swedish press is strongly in favor of this station being erected, so as to establish by telegraph direct communication with the United States, without having to go through a third country.

The Radio Corporation of America.

The Marconi Wireless Telegraph Company of America, which built up for this country the wireless enterprise which gave to the United States its commercial wireless connection with Europe and

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the other continents, has recently been acquired by a new corporation, the Radio Corporation of America. That corporation acquired, in addition to the stations and wireless installations of the American Marconi Company, the manufacturing branch of business with its valuable American patents, the Marconi Institute for the training of radio men and all the property of that company, also all of the wireless interests of the General Electric Company, making it the most complete and best equipped radio organization in the world.

An American organization in every particular, The Radio Corporation of America is entirely independent of any other corporation, although it has traffic agreements with the British Marconi Company, the French Marconi Company, and the Governments of Norway and Japan. It has thus excellent facilities which make it the controller of a wireless service that is world-wide. It has stations on the Atlantic and Pacific Coasts of this country, and at Honolulu and Japan, for communication, via its Pacific Station, to the Hawaiian Islands, and the Far East.

WIRELESS TO SOUTH AMERICA.

In addition to its installations in United States territory The Radio Corporation is organizing a new company to be called the Radio Corporation of South America, to cover South America with wireless installations which will give to the United States a direct means of wireless communication with South America. There can be no more valuable contribution to the great endeavor of American business to build up wider and better trade relations with the Southern Continent than will be afforded by the enlarged and intimate connection to be afforded by this chain of wireless stations.

For the present The Radio Company of America is circumscribed in its opportunities and plans for service by the fact that its stations, taken over by the Government as a war measure, are not yet released to the company; but when that is done, which is expected to be soon, the corporation will be enabled to push to completion the plans and policies it has evolved for the widest possible extension of radio-electric service in aid of American commerce.

THE TELEPHONE.

Service Changes.

Eugene S. Wilson, who for three years has been general counsel for the Central Group of Bell Telephone Companies, has been called to New York and will be in charge of rate matters for the Bell Telephone System. In his new position Mr. Wilson will report direct to the first vice-president. The appointment became effective January 1, 1920.

The appointment of Mr. Wilson to this important post in the American Telephone and Telegraph Company's organization is the result of his successful handling of the important legal matters of the Central Group and his familiarity with the legal aspects of the telephone business generally.

Allard Smith, general manager of the Cleveland Telephone Company since 1914, has resigned. On January 1, 1920, he became vice-president of the Citizens Savings and Trust Company, of Cleveland. Mr. Smith is succeeded by Robert G. Pate, formerly commercial superintendent.

Arthur DeWolff Walters.

The death of Arthur DeWolff, Walters, special agent, New York Telephone Company, on January 24, came as a great shock to his many friends in the telephone and railroad fields.

Mr. Walters was born June 14, 1880, in Newark, N. J. He entered the employ of the New York Telephone Company in February, 1905, as field agent of the commercial department, and early in 1911 was placed in full charge of the municipal, railroad and corporation accounts. He served in this capacity up to the time of his death. Mr. Walters was chairman of the Railway Telegraph and Telephone Appliance Association for the past five years and was active in the affairs of the association. He was also a member of the Telegraph and Telephone Division of the American Railroad Association, the Jovian Society and the New York Railway Club.

Of the many fine characteristics exhibited by Mr. Walters, one of the most outstanding was his ability to make friends and keep them.

Besides a wife he is survived by a son and daughter.

Pacific Telephone and Telegraph Company Changes.

On February 1, 1920, the present Inland and Northern divisions of The Pacific Telephone and Telegraph Company were discontinued, and in their place the following divisions have been established:

The Washington Division embraces the entire State of Washington and that portion of the State of Idaho in which this company operates. Division headquarters are at Seattle, Wash.

The Oregon Division embraces the entire State of Oregon, with division headquarters at Portland, Ore.

W. J. Phillips, W. D. Moore, and E. L. Breene have been appointed respectively division commercial superintendent, division superintendent of plant, and division superintendent of traffic of the Washington Division.

C. E. Hickman, H. J. Tinkham, and C. B. Allsopp have been appointed respectively division commercial superintendent, division superintendent of plant, and acting division superintendent of traffic of the new Oregon Division.

IN the year 1882, an underground cable was tried experimentally for telephone purposes at Attleboro, Mass. The cable was five miles long.

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WESTERN UNION TELEGRAPH COMPANY.

NEWCOMB CARLTON, president, who has been in Europe during the past six weeks, expects to sail from England for home about February 23.

J. J. MCCLOSKEY was, on January 21, appointed city superintendent at St. Louis, Mo., vice F. A. Mohr, transferred to Dallas, Tex., as general manager of the Gulf Division.

J. C. BAILEY, assistant superintendent of the Bay Roberts, N. F., cable station, has been transferred to the new cable station at Miami, Fla., for temporary duty.

EMMETT R. SHUTE, traffic engineer in Vice-President Fashbaugh's office, is making a tour of the technical colleges throughout the country in search of promising graduates qualified to enter the company's service.

H. P. CORWITH, traffic supervisor, New York, who has been absent on a trip of inspection to large offices in the central West for several months, has returned to New York.

SCOTT NICHOLS has been appointed chief operator of the main office at Fort Worth, Tex.

Eastern Division.

E. A. BAIRD has been appointed manager of the office at Syracuse, N. Y., vice George C. Card, transferred.

J. W. REED, superintendent at Manchester, N. H., held a business meeting at the Lafayette Hotel, Portland, Me., on January 21. Managers from various New England offices attended the meeting.

THE COMPANY has established an independent telegraph office in the passenger station at Bloomfield, N. J. The company recently moved its Rahway, N. J., office from a second floor location to a ground floor office. The shifting of this office completes a task undertaken some time ago by Superintendent W. A. Sawyer, having in view abolishing all offices on floors above the street level in the State of New Jersey.

J. W. COLE, manager of the Ilion, N. Y., office, has been appointed manager of the Ogdensburg, N. Y., office, vice I. S. Miller, resigned to enter other business.

H. J. O'DONNELL has been appointed manager of the office at Utica, N. Y., being transferred from Niagara Falls, N. Y.

Eastern Division, Third District.

EMPLOYEES of the third district commercial department on January 29 tendered a complimentary dinner at the Fort Pitt Hotel, Pittsburg, Pa., to C. B. Horton, district commercial superintendent, on the eve of his departure for New York, where his office will be located. The guests of honor were, in addition to Mr. Horton, W. L. Fogel, chief clerk; Thomas Gosden, auditor; Miles Reese, cashier. Mr. E. R. Collins, city superintendent, Pittsburg, officiated as toastmaster. The music for the occasion was directed by A. Carless. George Harris, commercial manager, accompanied by Mr. Kleber, rendered a number of vocal selections. Among the Pittsburgers present, were George T. Harris, Geo. E. Taylor, S. C. Moran, F. D. Byrne, J. C. Stewart, W. F. Fox, G. D. Chisholm, W. B. O'Hara, L. S. Ward, H. M. Brooks, A. W. Rinehart, E. N. Caithaml, J. C. Dreibholz, A. J. McBride, A. H. Lenk, W. F. Radford, H. G. Bebout, W. T. Sims, J. Keenan, and M. T. Finnell.

THOMAS GOSDEN, president of the Commercial Local, Association of Western Union Employees, upon leaving for New York was presented with a high grade suit case by his Pittsburg associates.

GEORGE I. HAUER, traffic supervisor, Pittsburg, Pa., main office, and well known throughout the service, died recently of pneumonia.

Western Union, Lake Division.

R. E. ECKLER, district commercial manager at Indianapolis, Ind., has resigned from the service to enter the automobile business. His telegraph training will be of particular value to him in his new field.

A. L. WELLINGTON, district commercial manager at Indianapolis, Ind., has returned from a visit with his family on the Pacific coast.

GEORGE A. CELLAR, superintendent of telegraph, Pennsylvania Railroad Company, Pittsburg, Pa., was a Chicago visitor recently.

F. W. BOOHER, in the service during the past fourteen years, has been appointed supervisor of the complaint department, Chicago, vice M. F. Strider, assigned to General Manager Cronkhite's office.

A. C. KAUFMAN, of Vice-President Willever's office, New York, spent a day in Chicago recently. While here he addressed a meeting of branch office managers, and in the evening was entertained at the Atlantic Hotel by City Superintendent Brown and Commercial Manager Eldridge.

MISS ESTHER NORDQUIST, manager of the office at Paxton, Ills., is engaged to be married in the near future and will reside in Minneapolis, Minn.

W. B. DAVIS, manager at Streator, Ills., died on January 22; the cause of his death being influenza.

AMONG THE INFLUENZA deaths recently announced is that of Mrs. Frank E. Serfass, wife of F. E. Serfass, tax agent of the third district. She was buried at McFarland, Wis., on February 1.

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MESSENGER THOMPSON, of the Iron Mountain, Mich., office, employs a unique delivery outfit. He has a collie dog trained to pull a sleigh, and as in Iron Mountain there is plenty of snow and good sleighing throughout the winter months, Thompson, plus the collie, have a record for fast pickups and deliveries.

ALFRED POE, junior operator of the office at Champaign, Ills., while passing the Hamilton Hotel recently, noticed that the place was on fire. After giving the alarm for the benefit of the fire department, Mr. Poe thought of the Western Union. He made his way into the building and removed the two Western Union time clocks from the walls, and, connecting the wires together to leave the circuit intact, carried the clocks back to the telegraph office.

W. J. BOULBOULLE, in charge of first district pony wires, and Miss Mae Newman, clerk in the first district superintendent's office, were married recently.

J. D. CLARK, veteran clerk in the office of the first district superintendent, is confined to his home as the result of a fall which dislocated one of his shoulders.

A. ISAACSON, clerk in the manager's office, has been advanced to a clerkship in Superintendent Brown's office.

L. LAFF, of Vice-President Willever's office, New York, was a recent Chicago visitor.

SUPERINTENDENT E. BOENIG, of Detroit, Mich., has been on the sick list the past two months. He is now recovering and hopes to be able to return to duty in the near future.

Cincinnati, Ohio, Western Union.

President Hayes, and Vice-President Campion of the Association of Western Union Employees, accompanied by Edward Wach, editor of the *Telegraph World*, Chicago, were Cincinnati guests on January 24.

A NEW CLASS ONE OFFICE was opened at North Baltimore, Ohio, on January 6, with Mrs. Ruth Henrich as manager.

W. E. BAXLEY, manager at Xenia, Ohio, has been appointed assistant manager at Akron. Ohio. F. H. Smith has been appointed manager at Xenia.

THE OFFICES AT Orrville, Sebring, Cuyahoga Falls, and Franklin, Ohio, are listed to become class one offices in the near future.

New York Western Union.

EMPLOYEES in the multiplex department at No. 24 Walker Street have started a weekly service magazine under the title of *"The Linefeed."* The first number of the paper contains a considerable amount of bright news matter, interesting service performance statistics, and social items of interest to the 800 multiplex employees of the office. T. A. Gallagher is editor; Francis Doorzon, Amedeo Principe, and Abraham Nygood, associate editors; Lilly Volkert, business manager, and Loretta Warnken, news representative.

J. J. MCSWYNEY, formerly supervisor in the operating department, No. 24 Walker Street, died on January 20.

MRS. E. R. MOTT, who operates the New York Produce Exchange circuit, supplying grain quotations, has been in the service of the company continuously during the past twenty-nine years. Mrs. Mott celebrated her fifty-sixth birthday on January 28.

DANIEL DAILEY, identified with this office for many years, and for some time past on the pension list, died on January 23.

Meeting at Denver, Colo.

About thirty office managers and field representatives of the Western Union Telegraph Company stationed in Colorado, Wyoming and New Mexico, gathered at a meeting held in the Albany Hotel, Denver, on January 26-27-28. The conference was devoted to discussions of efficient methods of traffic handling, and development of new business. Officials who attended the meeting were: A. C. Kaufman, general commercial agent, New York; A. B. Cowan, division general manager; E. E. McClintock, district commercial manager, and J. F. Reade, city superintendent, Denver.

The Electrical Aid Society of Philadelphia.

The Electrical Aid Society of Philadelphia held its thirty-second annual meeting, at the Drawing Rooms, 1620 North Broad Street, Friday evening, January 16, 1920.

The following officers were elected for the ensuing year—President, John A. Chapman; vice-president, George J. Wells; recording secretary, W. E. Van Arsdall; financial secretary, Robt. C. Murray; treasurer, Jas. H. Wilson.

Executive Committee: F. E. Maize, A. S. Weir, Chas. F. Meyers, and E. T. Aitken. John C. Smith was elected chairman of the Board of Trustees, and with Richard H. Conway and Wm. S. Stewart, constitute the entire board.

The Entertainment Committee of the past year headed by John C. Smith, chairman and Benj. F. Bryant, secretary, were voted the hearty thanks of the society for their labors; over four hundred dollars being turned over to the treasury of the society.

The inclemency of the weather kept the attendance low in numbers, but those who braved the conditions made up for those absent, by their enthusiasm.

Refreshments and dancing were then indulged in until every one was satisfied.

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POSTAL TELEGRAPH-CABLE COMPANY.

Postal Telegraph-Cable Company.

MINOR M. DAVIS, for many years electrical engineer of the company, has been granted a six months' leave of absence. He is anxious to get away from his desk and enjoy a much needed rest.

EFFECTIVE MARCH 1, the engineering and construction departments will be consolidated, and will hereafter be known as the plant and engineering department. J. F. Skirrow, who has been handling construction work since the death of former Vice-President Capen, will be in charge of the new department, with the title of chief engineer. J. P. O'Donohue, now division electrical engineer, eastern division, will be transferred to the new department as assistant chief engineer. Mr. O'Donohue will be succeeded by D. H. Gage as division engineer, eastern division.

M. A. MCCONNELL, for several years chief clerk to the general manager, has been appointed manager of the credit department, New York City. Harold J. Casserly has been promoted to the position formerly occupied by Mr. McConnell.

A. F. MCNEILL, for many years chief clerk in the New York City bookkeeping department, has been made manager of that department, effective February 1.

A NEW OFFICE is to be opened shortly in the Conway Building, Clark and Washington Streets, Chicago, where a long lease has been closed for ground floor space fronting on Clark Street. This office will serve one of the most important sections in the loop district, and is being fitted up with the latest standard equipment under the direction of division engineer W. L. Simpson.

J. W. WEED, manager of the office at Syracuse, N. Y., recently gave a talk before the Nineteenth Ward Republican Club of that city, on "The History and Development of the Telegraph." By means of telegraph stations set up in the room and connected by wires over miniature poles, Mr. Weed was able to give a practical illustration of the "pick-up, sending, relay, receiving, and delivery of a message." The talk was very effective.

E. P. TULLY, assistant to the genral manager, is visiting offices in the Mackay territory throughout the Southwest.

L. A. SCHIRMER, manager of the office at Jefferson City, Mo., in forwarding his January report, sent this notation to the auditor: "This completes my three hundredth report, and marks the completion of twenty-five years' continuous service at this station."

New York City Operating Department.

THE OPERATING ROOM presents a very attractive appearance since repainting. On account of the size of the room and the height of the ceiling, considerable time was required to finish the job, and everybody is glad that it is over.

CONGRATULATIONS are in order to Manager Feldman, of the New York *Times* office, and Vincent F. Fiore, chief of force days. Presidential candidates in both cases.

THE NEW YORK *Herald*, having been purchased by Mr. Munsey and consolidated with the morning *Sun*, the old "HX" office has passed out of existence. This was one of the first newspaper offices with direct loops. The *Herald* also maintained an efficient staff of telegraphers handling leased wires and ship news. L. J. Hands, of "HX," has been transferred to the New York *World*, vice T. J. Dunn, who is on indefinite leave of absence.

THE SYMPATHY of the force is extended to T. E. Quinn upon the death of his wife at Plainfield, N. J., January 21.

MANY FRIENDS OF Walter P. Phillips, ex-manager of the United Press and inventor of the famous "Phillips" code, were grieved to hear of his death at Vineyard Haven, on January 31.

A. F. KAVANAGH, chief clerk of the service department, is recuperating after a recent operation.

MISS N. MCGINTY, assistant to the city chief, has returned from a week's stay at Lakewood, N. J.

New York City Notes.

MANAGER MEYER, of the 14 Desbrosses Street branch, returned this week from a honeymoon.

OPERATOR CHARLES ROMANO, of 153 West 42d Street branch, and Miss B. Costello, chief bookkeeper of the Cotton Exchange, have been sufferers from influenza. Operator Romano has recovered sufficiently to return to work.

THE following transfers and assignments are reported: Miss N. Brown of the Gold Street branch to the Brevoort Hotel, Mrs. F. Reddy from the Brevoort Hotel to the Hotel McAlpin. F. J. Fortune has ben assigned to "PO" branch, and operator Dorner to the marine department.

Philadelphia, Pa., District Notes.

THE OPERATING DEPARTMENT has felt the combined effect of influenza and weather conditions, many employees finding it exceedingly difficult to reach the office on account of the condition of transportation facilities. A number of construction gangs were held in readiness to go in any direction from the city on possible wrecks.

ALBERT GOLDBERG, well known both locally and throughout the country as a first-class bonus operator, and who for many years worked the New York-Philadelphia bonus circuit, and lately the first Philadlephia-Boston bonus, died on January 30th after a short illness. He is survived by a widow

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and four children. His friends and fellow workers extend their heartfelt sympathy to Mrs. Goldberg.

SYMPATHY is also extended to operator Louis Kaminsky, whose sister, Miss Alice Kaminsky, died on January 27.

GENERAL TRAFFIC CHIEF M. M. REDDING and night traffic chief E. H. Block are both absent on account of illness.

Eastern Division, Third District, Notes.

FERDINAND MILLER, for many years day wire chief in the Baltimore operating room died January 9 after a month's illness. He had been twenty-four years in the service.

J. R. MCCLEARY has been promoted to the managership of Norristown, Pa., office, vice Miss M. D. Taylor who is now on her wedding journey. Mr. McCleary is succeeded at Princeton, N. J., by R. E. Cundy, former manager at that point.

RAY H. HORN is again serving as operator at Bethlehem, Pa. He relieved W. J. Burt, advanced to manager at West Chester, Pa.

SUPERINTENDENT C. E. BAGLEY has just completed a trip of inspection of offices in New Jersey.

Boston Postal Notes.

J. B PANSERA has been appointed manager of the Boylston Street branch located in the automobile district. The office has had a new front put in and the inside renovated.

The branch office at 262 Tremont Street has recently been modernized.

"Little Jeff" Katz has returned to all night messenger duty at the main office, after two years' service in the British Tank Corps, in Jerusalem. Jeff would have remained in Jerusalem if the Postal had had an office there.

MRS. M. BREWER has been appointed night manager at the Huntington Avenue branch. For the past six months Mrs. Brewer has been employed as receiving clerk at the Essex Street branch, where she mastered the telegraph end of the business.

A DIRECT Philadelphia circuit is being installed in the Summer Street office to take care of the increased wool message file.

THE TELEGRAPH SCHOOL has a number of promising pupils from the clerical and messenger forces. Mr. Cheever, assistant traffic chief, is in charge of the school.

The Old Wire Chief says: "The only rolling stones that ever gathered moss were those used as heroes by Richard Harding Davis."

San Francisco Postal.

MRS. TOWNSEND, wife of Don H. Townsend, night chief operator, has been in a hospital undergoing an operation, but is reported on the road to recovery.

A. B. RICHARDS, general superintendent, Pacific Division, accompanied by Superintendent H. C. Shaw, is on a trip to Reno, Nev., and Salt Lake City, Utah.

S. ELBERG, division cashier, is on a business trip to Seattle, Wash., and Portland, Ore.

FRANK ARNSBERGER, wire chief, returned to duty on January 24, after a two weeks' siege of pneumonia.

B. W. FIELDS, division electrical engineer, Pacific Division, is engaged in covering the trunk pole line between San Francisco and Sacramento. By "covering" we mean that he is making data and inspecting the line by way of a trip on foot along the route.

C. V. BARFIELD, tournament winning telegrapher, and who is now a practicing attorney in San Francisco, has not yet been completely weaned away from the music of the sounder. He occasionally drops into the big main office at night, and when he sits in to keep his agile fingers in telegraphic trim the man at the other end of the circuit quite naturally wonders whether it is Wheatstone, or if there is not more than one man sending.

Cook on Telegraph Law.

Mr. William W. Cook, of the New York Bar, and author of an extensive standard work on corporation law, now in its seventh edition, has written a new book which contains a complete review of the subject of Telegraph Law, including a digest of legal decisions governing the applications of law in all possible circumstances of telegraph building and operation.

The book was written for the benefit of the legal and executive staff of the Postal Telegraph-Cable Company, and for the information of legal practitioners likely to be engaged in telegraph litigation.

Mr. Cook is general counsel for The Mackay Companies, Commercial Cable Company, Postal Telegraph-Cable Company and the Commercial Pacific Cable Company, to which companies he has presented the book.

IN THE MARCH 1 ISSUE OF TELEGRAPH AND TELEPHONE AGE WILL APPEAR A DESCRIPTION OF THE RECENTLY INSTALLED TERMINAL TELEGRAPH OFFICE AT INDIANAPOLIS, IND., UNION STATION. THIS IS A THOROUGHLY UP TO DATE TELEGRAPH INSTALLATION. THE DESCRIPTION WILL BE AMPLIFIED BY ILLUSTRATIONS SHOWING THE EQUIPMENT LAYOUT, AND CIRCUIT DIAGRAMS SHOWING TELEGRAPH, TELEPHONE AND SELECTOR CONNECTIONS.

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Western Electric Co. Seeking New Capital.

STOCKHOLDERS ASKED TO VOTE ON CHANGE ON FEBRUARY 19.

The Western Electric Company, Inc., has requested its stockholders to vote on Feb. 19 on a proposed increase in the authorized common stock of the company from 150,000 shares of no par value to 500,000 shares of no par value, and to authorize an issue of $50,000,000 7 per cent. cumulative preferred stock similar to the present outstanding 6 per cent. preferred, which will be redeemed if the proposition is approved. By this plan the stated capital will be increased from $30,750,000 to $32,500,000.

It is stated in circulars sent to stockholders that the new financing will make provisions for taking up the $18,000,000 floating debt of the company and for other further business expansions. Only 200,000 shares of the 350,000 new authorized common shares proposed will be offered for subscription for the time being.

Present common stockholders will have the privilege of subscribing for the new shares of common at $180 per share in the proportion of 1 1-3 shares for every share now held.

In case the plan is approved $35,000,000 of the new 7 per cent. preferred stock will presently be issued. The $30,000,000 of 6 per cent. preferred stock now outstanding will then be redeemed at $120 per share and accrued dividends.

General Electric to Increase Capital.

STOCKHOLDERS TO VOTE MARCH 16 ON ADDITIONAL $50,000,000.

Directors of the General Electric Company at a recent meeting voted to call a special stockholders' meeting at Schenectady, N. Y., at noon, March 16.

The meeting will vote on a proposition to increase authorized capital stock from $125,000,000 to $175,000,000. Transfer books will be closed Feb. 17 and will reopen March 17.

The directors also approved a new issue of $15,000,000 in twenty-year 6 per cent. debentures.

Book for Telegraphers.

"Twentieth Century Manual of Railway, Commercial and Wireless Telegraphy," by F. L. Meyer, is the title of a practical book for railroad telegraph men and dispatchers. Every branch of the railroad service has been covered in a practical and masterly manner; and the information given is the result of wide observation and experience. This book is a complete education in railroad telegraphy, from first principles to the finished operator, who can be relied upon to do things in emergencies. It has a chapter on wireless telegraphy. Price $1.25. For sale by TELEGRAPH AND TELEPHONE AGE, J. B. Taltavall, Publisher, 253 Broadway, New York.

OBITUARY.

Death of Walter P. Phillips.

Walter P. Phillips, seventy-three years of age, died at Oak Bluffs, Mass., on January 31. Mr. Phillips retired from active business three years ago and spent his last days at a quiet spot on the Massachusetts coast. His sight began to fail two years ago and at the time of his death he was quite blind. During his retirement Mr. Phillips was the recipient of a continuous flow of friendly letters from old telegraph associates, and from younger men in the business who learned of his early interest in the working telegrapher. Mr. Phillips' wife and his only son died about five years ago.

Death of Jesse W. Crouse.

Jesse W. Crouse, one of the first seven military telegraph operators employed for civil war duty, died at his home in Philadelphia on February 3. He is survived by his widow and one son. The only two other survivors of the original seven Civil War telegraphers are David Homer Bates, of New York, and Richard O'Brien, of Scranton, Pa.

NORBERT BRUNET, aged sixty-eight, died at Ogdensburg, N. Y., on January 28. Mr. Brunet had been in the employ of the Western Union Telegraph Company, and Great North Western Telegraph Company, as lineman in the Northern New York district for many years, and was widely known as an expert workman and a man of excellent character.

Death of Harry McKeldin.

Harry McKeldin, for many years chief operator at Washington, D. C., for the Western Union Telegraph Company, died in that city on January 24, the cause of his death being pneumonia. Mr. McKeldin was sixty-eight years of age. He is survived by a son, Dr. Robert J. McKeldin, a physician in Philadelphia; two sisters who live in Baltimore, and one brother. Mr. McKeldin's wife was killed in an automobile accident two years ago.

MRS. KENT COOPER, wife of Kent Cooper of the Associated Press, New York, died on January 25, as a result of pleurisy following an attack of pneumonia. Interment was at Indianapolis, Ind.

Telegraph and Telephone Life Insurance Association.

The annual meeting of the Telegraph and Telephone Life Insurance Association will be held at No. 195 Broadway, New York, on Wednesday, March 10, 1920, at 4 p. m.

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Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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Our Day.

It may be that until the mass of the people arrive at a more advanced stage of intellectual development, such things as agreements and schedules will be of value in keeping the machinery of industry in working order; but there are ideas now steadily taking form which promise that the industrial readjustments under way will reflect in a mutually agreeable manner the present sympathetic interchange of views.

The day of the serf and the slave is not far in the past, but it is a day gone by. That this is so, marks progress. The tradesman, the worker, the laborer, have by dint of constant striving for social betterment made material progress, and the remainder of the course along which progress might profitably continue will be smoother if it is duly realized on all sides that the hope of the future lies in the desire of the doer to make individual progress.

The fiction and drama of the past made much of kings and princes as heroes. Times have changed: the modern book and modern play place the master workman in the leading role, and in the last chapter award him the honors and the gains.

It is quite apparent that the very great popularity of the moving picture show may in large measure be attributed to the foresight, the genius, of photoplay producers in providing a world-wide stage and a press agent for the best sheriff, the best cow-puncher, and the most fearless county judge in all Wyoming. The resourceful railroad location engineer, the clear-thinking bridge building foreman, the railroad towerman with up-turned shirt sleeves who saved a hundred lives by quick thinking and quick action—these, and many others of their kind are daily starred before millions of people as heroes worthy of the tears, the applause of every man.

A time has arrived in our country when, in every large business establishment, it must be some man's job to see that there are no ruts into which employees may gravitate, or be pushed, and so become obscure. Here is at hand a task for a new type of genius, and your true genius may not need as much aid from rule and regulation as in the past has been deemed necessary to attain desired ends.

In the telegraph, telephone and railroad businesses there is less excuse for the existence of ruts than in any other line of work. Here is continuous activity; intimate association with the play of mighty forces—steam and electricity. When work in these lines ceases to be interesting and attractive it will be the result of lack of vision on the part of those responsible for management.

Men who direct the daily work of large bodies of employees take a long step forward and accomplish much for the industry when they clearly visualize the fact that every billet, every post, is occupied by a human being with little or big prides and prejudices, small or large ambitions, and all such secret vanities of simple human nature.

In the communication services we must iron out the ruts; we must clear the stage for the station agent whose quick ear detects a broken car wheel in a passing train; the telegraph operator who got a death message through a "leaky" wire when everyone else around said it could not be done, and the telephone operator who stuck to the switchboard until the last person in the building had been advised to take flight from the flames.

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A MODERN RAILROAD TERMINAL TELEGRAPH INSTALLATION

NEW OFFICE AT INDIANAPOLIS, INDIANA

By John L. Niesse,
Telegraph and Telephone Engineer, C. C. C. & St. L. Ry., Indianapolis, Ind.

Recently installed railroad terminal telegraph offices have several features which distinguish them from the older type of telegraph office, which they replace.

The accompanying photographic reproduction shows the equipment layout of the Union Depot telegraph office at Indianapolis, Ind., recently completed. It may be noted that in the center of the operating table is mounted a switching cabinet equipped with telephone type pin-jacks, miniature signal lamps, and wire designation strips. This cabinet has a capacity of sixty lines. On a shelf

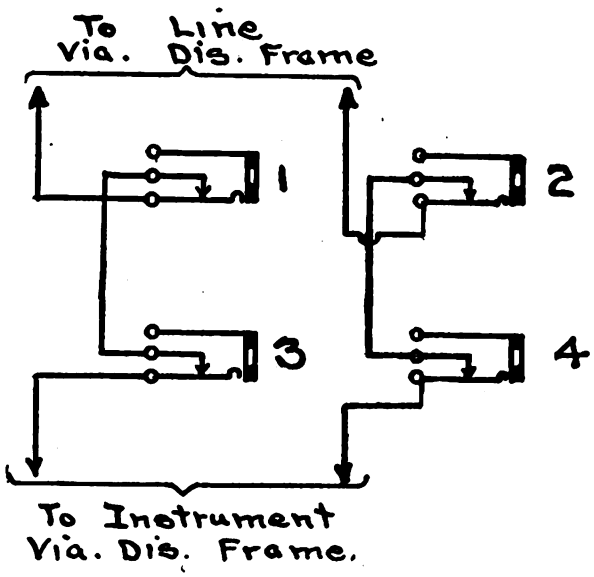

Fig. 1.

in the center—lengthwise—are mounted twenty main line Morse relays which may be permanently connected in as many circuits. On the operating table are mounted twenty telegraph selectors and four operating Morse sets. Operators located at any of the four typewriter positions may at will connect an operating set of instruments with any of the lines connected into the concentration cabinet in the center of the table.

In each end of the table, between the floor and the table, are fireproof wiring cabinets where connections are made between the apparatus on the table and the cables which go to the main line switchboard, shown under the clock, on the left of the picture.

To the right of each operating position may be observed a set of drawers and message-form trays, wherein are kept all forms used by operators. This provision keeps all forms where they are accessible; prevents them from being scattered over the table, and avoids the possibility of written telegrams and blank forms becoming mixed, causing a loss of messages.

In the rear of the main line switchboard is mounted a terminal frame where cables from the pole line and underground systems are connected.

In this office, the main line wires of several railroad companies are connected. From the C. C. C. and St. L. Railway, twelve telephone and four telegraph wires; Pennsylvania Railroad, five telephone and six telegraph wires; Lake Erie and Western Railroad, one telephone and two telegraph wires; Monon Route, two telegraph wires; Cincinnati, Indianapolis and Western, one telephone and three telegraph; Indianapolis Union Railway, two telephone, and Illinois Central Railroad, one telegraph and one telephone wire.

To provide testing facilities a reduced size section of standard Western Union pin-jack switchboard was installed, the telephone circuits being wired as shown in Figure 1, and the telegraph circuits as shown in Figure 2. All of the telephone circuits are grouped in the left hand side of the board, and the telegraph circuits in the right hand side. The wires of the various railroad companies are given distinctive colored designation marker cards.

The concentration cabinet is wired for forty telephone and twenty telegraph circuits. In the cabinet the telephone circuits are wired as shown in the diagram, Figure 3. The relay is in multiple

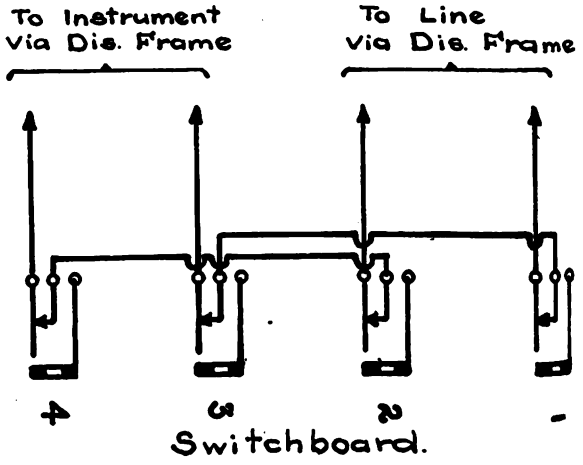

Fig. 2.

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with the selector bell and picks up when the bell rings. Its armature acts to place a ground contact on relay B, which in turn operates and locks itself by way of its front contact, so that it remains closed when, a moment later, the armature of relay A opens. In series with relay B are two line signal lamps (2T) and a pilot relay. When the 2T lamp lights up, the armature of the pilot relay causes the pilot lamp to light; and if a telephone call is received the light shows red.

As an operator plugs in to answer the call the ground contact is automatically lifted at the lower contacts of the pin-jack, and the circuit restored to normal.

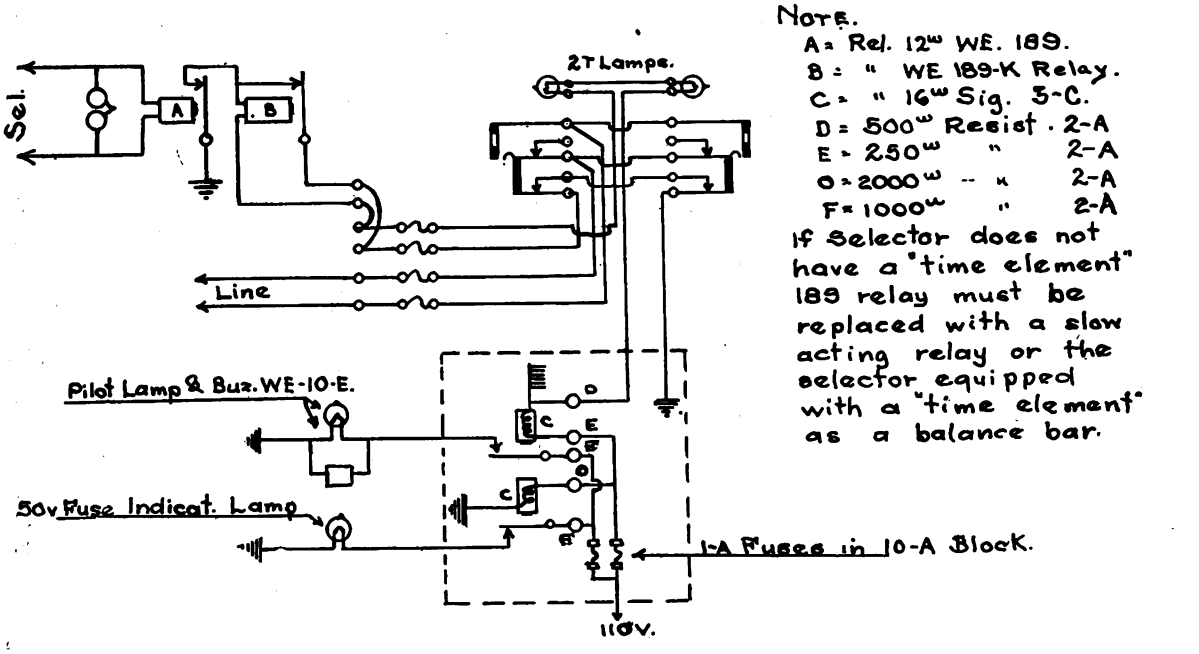
Note.
A = Rel. 12ω WE. 189.
B = " WE 189-K Relay.
C = " 16ω Sig. 3-C.
D = 500ω Resist. 2-A
E = 250ω " 2-A
O = 2000ω " 2-A
F = 1000ω " 2-A
If Selector does not have a "time element" 189 relay must be replaced with a slow acting relay or the selector equipped with a "time element" as a balance bar.
Sel.
A
B
2T Lamps.
Line
Pilot Lamp & Buz. WE-10-E.
50v Fuse Indicat. Lamp
1-A Fuses in 10-A Block.
110V.

FIG. 3.

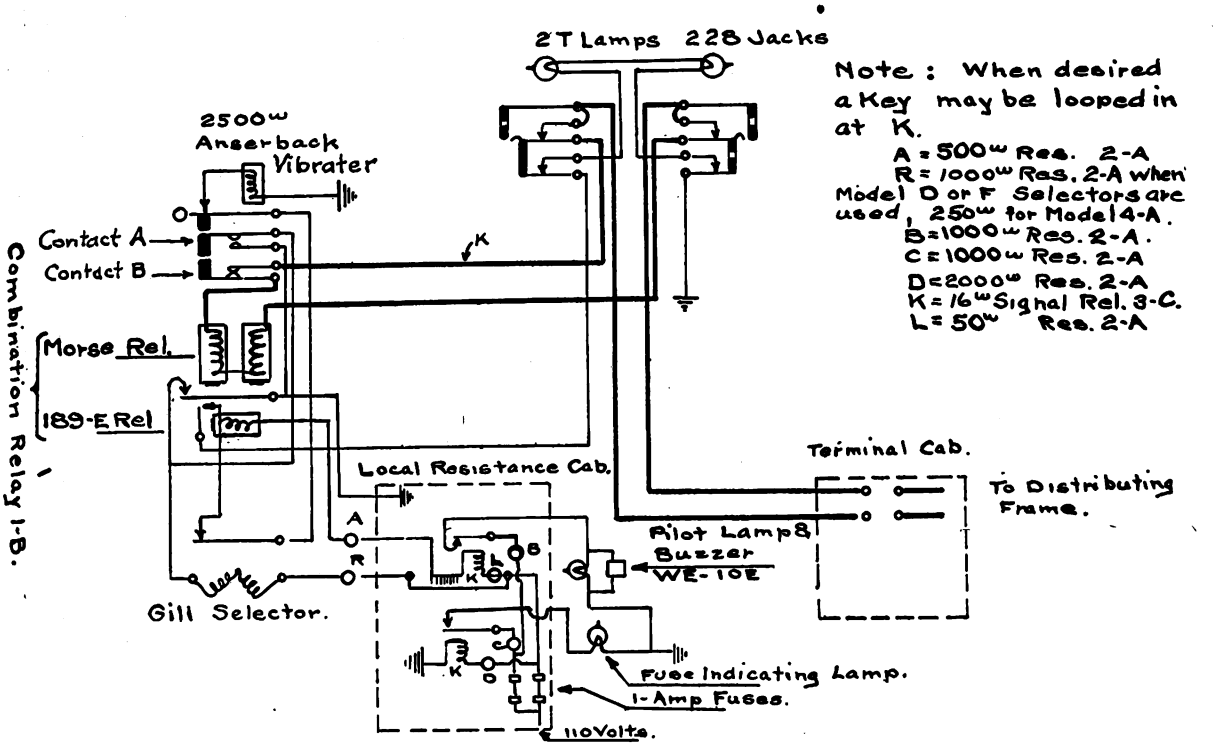
2T Lamps 228 Jacks
Note: When desired a Key may be looped in at K.
A = 500ω Res. 2-A
R = 1000ω Res. 2-A when Model D or F Selectors are used, 250ω for Model 4-A.
B = 1000ω Res. 2-A.
C = 1000ω Res. 2-A
D = 2000ω Res. 2-A
K = 16ω Signal Rel. 3-C.
L = 50ω Res. 2-A
2500ω Anserback Vibrater
Contact A
Contact B
Morse Rel.
189-E Rel
Combination Relay 1-B.
Local Resistance Cab.
Terminal Cab.
To Distributing Frame.
Pilot Lamp & Buzzer WE-10E
Gill Selector.
Fuse Indicating Lamp.
1-Amp Fuses.
110 Volts.

FIG. 4.

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To indicate occasional failures of power, a relay is bridged across the office side of the circuit fuses, the back-contact of the relay being connected to a lamp showing green mounted on top of the cabinet with the pilot relay equipment.

The telegraph circuits are wired as indicated in the diagram, Figure 4. The armature of a 100-ohm Morse relay operates the selector. When the selector contact closes relay 189-E, that relay automatically locks its armature in the signaling position; the lamp signal showing white. Also, the closing of the selector contact causes the operation and vibration of a device known as an "answer back." This is so arranged that the closing of the upper contacts (A) shunt the relay contacts before the main line is opened an instant later, by the lower contacts (B). This answer back opens and closes the main line circuit. The opening and closing of the line contacts results in a signal being sent back automatically over the line as a notice to the calling office that the signal has registered. As the answering operator plugs in to respond—inserting a plug and cord connected to a master set—the lower contacts of the jack remove the ground contact and restore the line to normal.

In the photographic reproduction it may be noted that on the far side and in the foreground long tables are situated conveniently to the operators' positions. Each of these tables has ten trays which are used for the purpose of holding train orders for delivery to train conductors. This arrangement prevents confusion when there are many orders to deliver, as it is unnecessary for conductors to go to the operating tables and hunt through a pile of orders to locate orders intended for them.

Every feature of this office has been provided with a view to affording convenience and of making it possible for a minimum number of operators to transact a large volume of business efficiently.

The plans for the equipment and installation were supervised by Stanley Rhoads, telegraph and telephone engineer, New York Central Railroad, under the direction of E. C. Keenan, general superintendent of telegraph, Eastern Region, United States Railroad Administration, New York.

THE RELATION OF MAINTENANCE TO TOLL-LINE TRANSMISSION

Toll line maintenance in the generally accepted sense of the term has been a distinct institution in the telephone organization for many years. Until recently this term applied to physical maintenance only, and covered the work of clearing such trouble as actually interrupted service or the correction of construction defects that were discovered through visual inspection.

Today, due to improved appliances and methods in telephone operation, this term has come to embrace a much broader field than outlined above, and necessitates that considerable specialized attention be devoted to the subject. There are two requirements, which must be met to produce commercial transmission, volume and intelligibility. The first requirement is provided by proper engineering, as is also the second, in so far as it is affected by proper type of line and equipment installation. However, inductive noise on a circuit is quite frequently the cause of low intelligibility, and this is a special case for investigation with each circuit or group of circuits. The proper study of these special cases embraces many factors, not a few of which are of a highly technical nature.

The first indication of toll line trouble is usually that the line becomes noisy, so that toll maintenance may be described as the work of keeping the lines quiet. Listening tests are, in general, of considerable value in determing relative amounts of noise and their disturbing influences on the various toll circuits. In a rough way these tests may be made by comparing two circuits. For the purpose of such comparison, however, a standard is, of course, essential, so that unless this fact is borne in mind, such listening tests may be misleading in drawing conclusions with reference to the comparative noise on various circuits. All factors, such as the length of line and the manner in which it may be used in connection with other circuits must be considered, and comparisons should be made only between various circuits in a given group, which have practically the same length of line and the same physical make-up.

Noise on a short toll line should be a matter of particular attention, since in connecting this to another line for making up a long toll circuit this condition may be considerably aggravated or even increased to a point where conversation is impossible, although it would give commercial service for short haul work.

Normally the transmission value of a phantom circuit is higher than that of its component physicals. On the other hand, the requirements of the phantom circuit as to insulation resistance and balance are proportionately more rigid. Assuming that the make-up of the side circuits is of such character as to furnish good transmission, it follows that a phantom circuit placed on these physicals with proper terminating equipment should be well within the limits of good transmission. Insulation resistance and proper balance will then be the index as to the kind of transmission furnished by the

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phantom. Unfortunately the fact that quite a number of physical side circuits do not agree with these more rigid requirements has fastened upon the phantom circuit the stigma of being considered an inherently poor transmitter of speech. Measurements of insulation resistance and resistance unbalance come within the field of routine maintenance testing. In this respect the plant field forces can aid materially in overcoming the above difficulty by setting a high standard of maintenance with regard to these points.

Consideration of the following basic facts, with reference to disturbing elements on a transmission circuit, will suggest certain rough methods of testing and analysis which, while not conclusive, will still furnish valuable information in connection with a study of disturbing conditions.

Parallels with power or foreign communication circuits are primary factors which induce noise on telephone circuits.

This induction occurs at particular sections of the telephone circuits and may be roughly localized by sectionalizing the exposed circuit.

The induction may be greatly aggravated by unbalanced conditions of the telephone circuit such as high resistance joints, bridged legs particularly on phantom circuits, non-quadded toll entrance cables of considerable length and short lengths of exchange cable with long multiple taps and used for toll entrance purpose.

A real necessity in the work of improving toll transmission is the active coöperation of the plant supervising forces, and an endeavor on their part to personally investigate all toll circuits, particularly at the small outlying points, with the object of educating the local plant forces along the lines herein mentioned, so that they will observe closely the small troubles that tend to lower transmission values.—E. H. Long, in *The Pacific Telephone Magazine*.

A Long Telegraph Circuit in the British Isles.

With the ratification of peace has come the dismantling of the longest telegraph circuit provided within the bounds of the Kingdom.

It was, of course, an emergency circuit and worked between the admiralty, Rosyth naval centre, Invergordon naval centre and Scapa Flow. Wheatstone apparatus was employed, and the length of the circuit necessitated the use of no less than three repeaters—at Preston, Glasgow and Invergordon.

The circuit was provided by means of spare wires in the London-Glasgow underground cable and various commercial wires in the northern section, including a submarine cable length from Caithness to the Orkneys.

The approximate length of the circuit was 900 miles.

THE dry-cell primary battery was introduced in the year 1886.

TELEPHONE REPEATER LINKS NOVA SCOTIA WITH AMERICAN LONG DISTANCE SYSTEMS.

Direct telephone communication between Halifax and New York and other cities in this country was established in January by the New England Telephone Company, and, by using various units of the Bell system, it is now possible for one in the capital of Nova Scotia to talk directly even to Pacific Coast cities. Actual connections have been set up already between Halifax and Savannah, Ga., and Halifax and Chicago, distances of 2,000 miles.

Before the war Halifax could not talk to Montreal without an intermediate operator to repeat the message, but by rearrangement of lines and circuits and the installation of the telephone repeater, Halifax is linked up with the long distance system of the United States. These telephone repeaters have been installed by the Maritime Telephone Company at Halifax, the New Brunswick Telephone Company at Moncton, N. B., and the New England Telephone Company at Bangor, Me.

Telling of the achievement, the bulletin of the Maritime Telegraph & Telephone Company, Ltd., of Halifax, says: "This Halifax repeater accomplishes two conditions: First, it brings all points in Nova Scotia within the range of commercial transmission. Second, it puts Nova Scotia on the telephone map and links up our system with that of the New Brunswick, New England and Bell of Canada systems. During the latter half of September satisfactory connections were completed on messages between Yarmouth and Boston, Halifax and Toronto, Halifax and Bridgeport, Conn., and other points.

"The installation of this repeater marks an epoch in our progress. Our first long distance service was established in 1887, between Halifax, Truro, New Glasgow and Amherst. From this beginning developments were completed to bring all the important points of Nova Scotia within reach by telephone."

"A" for Adam, and "E" for Eve.

A telephone clerk in the San Francisco, Calif., office of the Postal Telegraph-Cable Company, had finished copying a telegram from a patron, and then began repeating the contents of the message according to instructions. The first word of the message was "Ship," and the clerk, quite properly, started in: "S, for Samuel, H, for Henry, I, for Isaac, P, for Philip," and about this stage she realized that the patron was making signs, or yelling for help. When he succeeded in "breaking", the clerk was advised that the sender of the message did not care a Chinaman's back-tooth about her friends Sam, Henry and Ike. What he wanted was to have his message read back to him. What could the poor girl do?

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MACKAY COMPANIES ANNUAL REPORT FOR 1919.

The annual report of the Mackay Companies, dated February 16, 1920, states that in the past year's operations the gross receipts of the ocean and land line systems owned by the company, since their return from government control on August 1, 1919, have steadily increased, and the net profit, while not equal to the increase in gross receipts, due to increased expenses incident to all classes of business, is quite satisfactory.

This is the situation, although on August 1, 1919, the land line system reduced the telegraph rates twenty per cent. by eliminating the twenty per cent. increase in the rates which the Postmaster General put into effect on April 1, 1919. The report states that "By careful and enonomical management the company's land line system is able to return to the old rate without loss and with sufficient profits to justify the continuance of such return, unless circumstances change."

In accordance with the policy of the trustees to maintain the cables, plant and equipment of the system in the highest state of efficiency, renewals of parts of the oldest cables are being made, and it has been decided to build a new cable repair ship to replace the Cableship "Mackay-Bennett," which is now old, and would require a considerable amount of repairs and renewals at a large expenditure to enable her to continue her work.

During the war the cable system, in common with other cable companies, suffered a good deal from reduced facilities, owing to the interruptions of its cables in deep water and within the war zones, which it was impossible to repair promptly owing to the control over the movements of cableships by their respective governments, and the danger of the lurking submarine. These reduced facilities, coupled with the enormous volume of government messages, caused heavy congestion and consequent delay. Everything possible was done by the operating staffs of the companies to cut down the delay. The United States Government appointed a committe of technical experts to look into the methods of operating cables with a view to increasing the carrying capacity, but this committee was not able to suggest any improvement that had not already been anticipated by the companies. At present a corps of expert mechanicians and electricians is engaged in experiment and trial of new devices, which give promise of increasing the efficiency of the existing cables and the trustees hope to be able to announce shortly the adoption of novel apparatus of a highly efficient order. The object aimed at is direct transmission between America and Europe at speeds equal to or better than the speeds obtained in indirect transmissions. The solution of the difficulties, which the trustees are assured are fast being overcome, will eliminate the errors and delays inseparable from the receiving and re-transmitting of cablegrams at intermediate points. Immediate direct communication will be established between the extreme points of the cable system and the uncertainties incident to indirect transmissions will disappear. So much progress has been made that the attainment of these objects is practically assured.

Under war conditions, when cable facilities are freely used for the transmission of government messages, it is not surprising that a considerable amount of unnecessary matter is placed upon the cables as government correspondence, which could probably be dealt with as effectively by the mails. The company made representations to the government in regard to this matter with a view to conserving the limited cable facilities, but it was evidently a difficult situation to control, because the volume of government traffic continued to increase and abuses of the privilege of government service occurred. Government messages are those which are on official business of the government only, and paid for out of public funds, but messages have been sent from one government department to anther, transmitting the messages of private interests.

The censorship of cable messages introduced by the allied governments during the war was discontinued on July 23rd, 1919. This resulted in a resumption of the use of codes for condensing the length of messages, but on the other hand there was a large increase in the number of messages by reason of the freedom of cable facilities for commercial communication. The cable system consequently continues to handle a heavy volume of traffic, and in fact so heavy as to necessitate the consideration of laying additional cables between the United States and Europe as soon as reasonable and prompt delivery can be obtained. The outlook for the expansion of trade and the importance of sufficient cable facilities in connection therewith is fully realized by the trustees, and no opportunity will be lost to extend the cables of the System to keep ahead of the rapidly growing trade of the world.

All new cables and land lines will be paid for, not by the issue of new capital, but by the use of the reserves of the System which are available for such purposes. The Company's reserves are invested in bonds of the United States, British, French and Canadian governments, as well as bonds of American municipalities and railroad companies, and are available and ample for any extensions on land or ocean. The companies have also continued their investment in preferred shares of The Mackay Companies by purchase in the market. They have also been purchasing the debenture bonds of The Commercial Cable Company in London, the low rate of exchange being an important element.

The necessity for new capital expenditures on land and ocean emphasizes the wisdom of the policy of the trustees in gradually building up a satisfactory liquid reserve, which puts the companies in a strong position now when money is high and governments and industries are competing for funds in the market. When the business reaction comes, as come it will sooner or later, the companies will be in a position to sustain themselves during the lean years.

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It is now fifteen years since the outstanding common shares have been increased, and thirteen years since the outstanding preferred shares have been increased. Meantime no notes or bonds have been issued or debts incurred. The employees continue to show their confidence in the system by their continued and increasing share-holdings therein. The income of the subordinate companies of the Mackay Companies is greater than is required to pay the dividends of the Mackay Companies, but its policy is to obtain from those companies only sufficient funds to meet those dividends.

For the year ending February 1, 1920 the company's report shows the income from investments in other companies as $5,021,094.82. Dividends paid during the year amounted to $4,355,988.00. Operating expenses including Federal income taxes, amounted to $644,883.68. The company's investments amount to $93,294,192.57; cash on hand, $30,581.93. Against this the liabilities are: preferred shares issued $50,000,000.00; common shares issued $41,380,400.00, and the surplus $1,944,374.50.

TELEGRAPH OFFICE MANAGEMENT

By John F. Looney,
Superintendent, Postal Telegraph-Cable Company, Indianapolis, Ind.

The editor of Telegraph and Telephone Age has asked the writer to prepare an article for publication dealing with telegraph office management, the sub-divisions of the subject to cover "A schedule for the manager's routine duties," "Cooperation between manager and chief operator," "The way to procure new customers and hold them," "The value of the telephone as an aid in the delivery of messages," and "The best way to keep telegraph books up to date."

These subject heads refer to very important considerations in telegraph office management, and while a great deal depends upon the size of the office—the amount of traffic handled—it is true that, in general, the same principles apply to all offices. Also, it is well for the manager of a small office to keep in mind in all of his activities that he is in training for advancement to a larger office when opportunity permits, and in order to be prepared for the larger field he should be conversant with the methods employed by managers at larger offices in rendering efficient service.

Successful managers of large offices generally have in operation methods of office handling which provide smooth working of all departments, but there is ever present the possibility that routine may grow stale, and in view of this it is believed that no matter how large, or how small the office, managers should at all times be on the lookout for new ideas which will make their work easier, their receipts larger, and their staffs more contented in their duties.

SCHEDULE FOR THE MANAGER'S ROUTINE DUTIES.

The things that stand out the most prominently are:

Be on time in reporting in the morning in order to set a good example to the other employees.

Take particular notice of the condition of the office as to whether or not the janitor has done his work properly. See if the office presents a neat appearance; if the counter and desks are clean, chairs in order, locker doors closed, windows clean, top of lockers free from bundles, packages, etc., floors clean and free from paper wads, office force neatly dressed; and most important of all—a pleasant smile for each customer, courteous treatment and lending a helping hand to those who are not familiar in the framing of a telegram.

The manager upon entering his office should first of all greet the employees with a "Good morning"; find out the conditions in general, open his mail and answer same as promptly as possible; have a report on his desk from each department to see if all employees have reported for duty. Where he is short of help, arrangements should be made to see that this is taken care of with the least possible delay; visit each department personally and see that things are moving in proper shape.

His morning should be spent mostly around the office. After lunch he should try and find time for solicitation purposes, visiting branch offices and helping them out in any troubles they might have.

He should return to his office about 3:30 or 4:00 o'clock, go over his mail and sign same, and make a short visit in the different departments to assure himself that everything is in proper working condition.

A successful manager must be congenial and have the confidence of all employees, as this helps to get their co-operation. A manager can do this and still have all the employees respect him. It is not good to be unduly familiar with any one in particular (or in other words have a pet). This creates discontent and dissatisfaction. Fairness and firmness are very necessary attributes.

COOPERATION BETWEEN THE MANAGER AND CHIEF OPERATOR.

This is of the utmost importance—one cannot get along without the other. They should confer

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daily. The chief operator should keep the manager and his branch offices fully posted concerning the condition of the wires and the traffic conditions. The manager, to assist the chief operator, should call his attention to improper form and bad copies which reach the delivery department and in this way insure that neat and proper formed telegrams are turned out to the public.

The chief operator should also assist the manager in seeing that call circuits are kept in first class shape; frequent insulation tests should be made of the call circuits to see that they are in good working condition. The chief operator as well as the line department and manager should keep a record of the call boxes installed, call boxes removed and non-producing call boxes.

THE WAY TO PROCURE NEW CUSTOMERS AND HOLD THEM.

To procure new customers, first of all, is to convince them that you have something to sell them and that article is *service*. In procuring new customers by coming in direct contact with them either in the main or branch offices, courtesy and prompt attention are the most important factors.

To hold customers, I feel that it is highly important that we be honest with them in telling them wire and traffic conditions when they are abnormal. A customer sends a telegram because it is urgent and if we are fair with them in keeping them advised of the conditions, they will appreciate it. Prompt and courteous attention at all times is necessary from all departments.

THE VALUE OF THE TELEPHONE AS AN AID TO THE DELIVERY OF MESSAGES.

This is a most important subject and we all know that the telephone is one of the greatest assets the telegraph office has for the delivery of telegrams. Without it, in the larger cities, we would be seriously handicapped. It puts the telegraph company in touch with numerous subscribers in the outskirts of the city who do considerable telegraph business and who are willing to take their telegrams over the telephone in order to get them promptly. In the majority of cases they request that confirmations be mailed but it certainly assists the telegraph company wonderfully in these days in being able to telephone telegrams to the addressees. If we had to depend upon the delivery of messages by messengers to some of our customers in the outlying districts who now take telegrams over the phone we would have to have an army of boys, and they are a scarce article at this time, at any price. The telephone is also a great aid in securing telegraph business from customers as they also want to telephone their messages to our main office in order to prevent delay.

In our telephone departments in the larger offices are some of the best paying branch offices and these should be in the hands of competent supervisors and experienced telephone operators. Here too, it is highly important that courtesy and accuracy be practiced to the highest degree—a pleasing voice over the telephone is about as good a business getter as I know of.

Quite a number of social telegrams addressed to residence districts are accepted by telephone, saving considerable delay in delivery. Quite often the delivery of telegrams by telephone has saved the addressee both time and money. The telephone as an aid in the delivery of telegrams is indispensable.

THE BEST WAY TO KEEP TELEGRAPH BOOKS AND RECORDS UP-TO-DATE.

The double entry bookkeeping system as used in our service is filling a long felt want in a number of offices. The best way to keep these books is to spend the necessary time each day in posting them. The bookkeeping department should prepare the figures on their daily statements, office receipts of various kind, and turn the figures over to the cashier to be entered in his books and to do this the various clerks and bookkeepers must keep to their end of the work. If they are allowed to get one day behind it not only delays the bookkeepers but delays the bills in getting out promptly on the first of the following month.

Accuracy is also a very important factor in the bookkeeping department for keeping the books and records up to date.

In conclusion I will say that there may be little in this article that is new to successful managers, but it is my experience, as well as that of many others in the service, that we cannot too often review and study all progressive thoughts and ideas which come to us in our daily work. In a given emergency, or in a given undertaking when a man decides to do a thing a certain way because that is the right way, he feels that he is on safe ground if the action he takes has successfully been applied in other similar circumstances. This is what we gain from an exchange of ideas: we learn what others are doing to make a success of their work, and if we are open minded we can very often profit therefrom.

Imagination.

"There is a natural tendency among men, when they meet the word 'imagination,' to give to it a meaning which places it among the gewgaws of the intellect. But this is far from its true meaning. It is not an article for dreaming, fanciful men only to deal with. It is as much the property of men of the world as of men of letters; as much the property of the soldier as of the poet. It is the motive power of the whole machinery of the mind; the origin of our endeavors; the prompter of our success."

Phillips' Code Now $1.25 Per Copy.

Due to several increases during the past year in printing and binding costs, the price of Phillips' Code will be raised to $1.25 per copy, on March 1, 1920. The present edition, with supplement, contains the latest revisions and all new abbreviations in use by operators who work fast Morse wires, and by press operators.

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A TELEGRAPHER OF THE CONFEDERACY

The death recently at Russellville, Ky., of Emmett Howard, who for many years was manager for the Western Union Telegraph Company at Memphis, Tenn., calls attention to the fact that the ranks of the telegraphers who participated in the stirring scenes of the Civil War are rapidly thinning. Mr. Howard, when a boy, was in the service of the Confederacy, and performed many daring exploits in behalf of the Southern military forces.

We have had many accounts of the brave deeds of Northern telegraphers during the great conflict, when the telegraph first was used in warfare. W. R. Plum, David Homer Bates, J. E. O'Brien and other war telegraphers have placed in the pages of history true stories of the strategy exercised and the heroism displayed by Lincoln's and Grant's operators, but so far we have had only a few reports of the deeds of telegraphers who served the Confederacy.

Among the young telegraphers of the South who answered the call to service at the beginning of the war, none served with greater distinction than Emmett Howard. Two years before the war began he learned to telegraph at Blandville, Ky., under the direction of Captain Edward Burk, who had charge of early telegraph line construction through the South. Shortly after war was declared Federal forces captured Blandville, but the young operator, learning of the approach of the troops, decided to engage in the big adventure on the side of the Southern States. Quickly dismantling his office, and filling a knapsack with a small store of provisions—and a pocket telegraph set—he decamped to a secluded spot in the hills a short distance from the town, and along the route of the telegraph line.

From this vantage point he was able to keep the Confederate commander at Columbus, Ky., advised as to the activities and movements of the Federal troops; for, upon taking his position in the hills, he had shinned up a pole and cut the wire, bringing the Columbus end of the circuit down to his telegraph instrument, grounding the other terminal of his set with a section of line wire.

Upon observing, later on, that the troops had formed in marching order and were headed for Columbus, young Howard immediately apprised the Confederate commander of this and was instructed to ground the circuit and proceed to Columbus ahead of the Federals. In an attempt to save time he started across country away from the roadways and although he made rapid progress the going was rough, so when he arrived in sight of Columbus he discovered that the Federals traveling on the main road, had reached there ahead of him and had command of the roads and paths into the town.

While it was still light the youngster looked over the ground from a distance and selected a possible entrance into the town which might be negotiated after darkness set in; and, hiding himself in the woods, awaited the coming of night. Finally, when it became too dark for him to remain comfortably where he was, he set out along the route he had selected, and by worming his way, Indian fashion, through the grass and weeds, he eluded the sentries and entered Columbus about midnight.

His success in avoiding contact with the Federal troops, together with his evident enthusiasm in the cause of the South, prompted the Confederate commander at Columbus to trust him to carry important dispatches to Memphis. Once more the elusive telegrapher wormed through the lines and proceeded by a circuitous route to a small village below Columbus and on the railroad line where he hoped to find an available locomotive which might be requisitioned to carry him a part of the way, or all of it if possible.

One can imagine his delight at finding an engine with steam up and headed South; for such was the case, and in a few minutes he was in the cab, where his dispatches and his story produced the desired effect upon the engineer. The engineer must have known there was no other engine on the division, for without waiting for further orders he left town with the throttle in high. The speed was so terrific and the roadbed so uneven that the telegrapher thought surely the next curve would be the end of the trip. Thinking of what a serious thing a wreck would be, with probable failure to deliver the dispatches, young Howard suggested to the driver that he slack up a bit to avoid danger; but the only answer was a blank stare, another pull on the throttle and more speed. At the end of another mile the youngster was thoroughly frightened at the actions of his companion on the driver's seat. Climbing up beside the engineer, Howard tried to engage him in conversation, and to his horror discovered that the man was hopelessly crazy.

Here was a situation which called for something beyond ability to tap a telegraph wire or to crawl Indian style through picket lines. His quick wit, however, was once more to come to his rescue. He began telling a story of a wild and impossible escapade which required him to gasp for breath occasionally and laugh as though buttons could no longer contain him. The story was so crazy that the mad engineer seemed to understand it and got down from his seat in order to devote his entire attention to the subject. As the driver gave up his seat the telegrapher redoubled his efforts in exaggeration; but at the same time moved up to the throttle, and while keeping the mad driver busy with the yarn, shut off the steam, allowing the engine to come to a standstill a quarter of a mile further along. Continuing to laugh hilariously he backed up to the gangway and dropped off the side of the engine and made for safety before the wild engineer had time to figure out what was taking place.

Presently returning to the railroad track, Howard continued on his way toward Memphis where, after many hardships and much privation, he arrived in record time and delivered the dispatches as ordered.

He remained in the Confederate service until the end of the war, and on several occasions ren-

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dered service which brought him the thanks and gratitude of commanding officers.

After the termination of the war, Mr. Howard entered the service of the Western Union Telegraph Company and served as manager at a number of important offices in the South. For a period of twenty years he was manager at Memphis, Tenn.

He married late in life, had no children, and was a widower at the time of his death.

C. H. Waggener, present manager for the Postal Telegraph-Cable Company of Texas, at Orange, Tex., is a nephew of Mr. Howard.

VOICES OF THE WIRE TO BE RECORDED.

Morse Telegraph Sending of Thomas A. Edison to be Preserved for the Ears of Posterity.

At the joint reunion of the Old Time Telegraphers and Historical Association and the United States Military Telegraph Corps held in Cleveland, Ohio, September 10-12, 1919, a resolution was presented by E. P. Griffith, superintendent of telegraph of the Erie Railroad Company, which had in view inviting Thomas A. Edison to place on phonographic record a message to telegraphers; Mr. Edison himself to send the message by means of a key and sounder.

The resolution was unanimously adopted, and President Canniff of the Old Timers Association appointed the following committee to take the matter up with the wizard of electricity and who in his youth was a star telegrapher and later inventor of many telegraph devices and systems: David Homer Bates, chairman, and Messrs. Charles P. Bruch, L. B. Foley, E. P. Griffith and Charles Selden. To this committee has since been added the name of W. H. Meadowcroft.

Arrangements have now been made with Mr. Edison to carry the project to a reality, and he has agreed to have made a pure nickel master record which will last permanently and from which duplicates may be made.

Mr. Edison's Morse sending will be preceded on the record by an introductory speech by David Homer Bates, and it is the intention to have this record placed upon a machine for reproduction at future gatherings of the Old Time Telegraphers and Historical Association and United States Military Telegraph Corps.

The reproduction of Mr. Edison's sending at the future annual meetings of the old-time operators will be a very impressive feature as all operators present will be able to read the message by sound.

For the benefit of non-telegraphers who attend the meetings it is the intention to have Mr. Bates copy the message by pen, and place upon a screen the written copy as reproduced in that gentleman's clear, easily read telegraphic penmanship.

The members of the committee are to be congratulated upon carrying the matter forward successfully and it is hoped that other Morse records will be made containing the hand signals of famous telegraphers. Among the first to be made should be those of D. H. Bates, A. B. Chandler and Richard O'Brien.

United States Veteran Signal Corps Association.

SPANISH WAR DIVISION.

The twentieth reunion of the United States veteran Signal Corps Association took place at the 71st Regiment Armory, New York, on Saturday February, 7. A moving picture show giving several reels of actual war views with General Russel of General Pershing's staff describing the many incidents, was well received by the 300 present, many of whom were members of the 1st Signal Corps and 2nd Signal Corps, in France during the war, and many of the boys saw for the first time their own pictures while stringing wires and taking messages on the firing lines. General Russel gave a very interesting talk, showing the value of the work of the Signal Corps.

A picture entitled, "Keeping the Home Fires Burning," of five reels, showing the many war industries at work in this country with ship building, steel workers, uniform workers, etc., was well received and much enjoyed by the men from overseas. After the moving picture show a business meeting was held and officers elected for the ensuing year. Business of importance was transacted and officers made their yearly reports,

A committee was appointed to draft resolutions contemplating taking in the World War veterans as members.

After the meeting the Corps sat down to a banqquet at the Park Avenue Hotel. General Russel gave a very interesting talk on the world war from the day he arrived in London with General Pershing until the armistice was signed. The other speakers were General Dunwoody, Captain T. F. Clark, Captain Geo. Lee, and H. A. Emmons. Captain T. F. Clark was toastmaster and received a rousing reception when he spoke on his administration of the past year. The association is in fine shape and has a membership of 300. The new officers elected for the ensuing year are: Chris. F. Johnson, 15th Co., Commander; Jessie P. Larmier, 8th Co., Senior Vice-Commander; Edward M. Oliver, 11th Co., Junior Vice-Commander; George A. Marshall, 3rd Co., Adjutant; John J. Hannigan, Chaplain. Chairman of the Executive Committee, Capt. Thos. F. Clark.

The Old Wire Chief says: "Your reputation does not consist of one man's opinion of you—be it good or bad."

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Edwin F. Howell—An Appreciation.

BY WALTER C. BURTON.

Edwin F. Howell was born at Carbonear, Newfoundland, on December 31, 1854. He received his education at the Harbor Grace grammar school and became a messenger in the office of the New York, Newfoundland and London Telegraph Company, at Harbor Grace. He applied himself to the study of telegraphy and was transferred to the cable relay station at Hearts Content in March, 1870, before he was sixteen years of age. Two years later he was transferred to the cable station at Port Hastings and in 1878 at the age of 24 he came to New York and joined the night force of the Western Union Telegraph Company at 195 Broadway. An agreeable personality, unusual natural ability and intelligence and ardent devotion to duty soon marked him for promotion. In 1881 he was appointed all night wire chief, and later was chief on the eastern, southern and western sections, and became western division chief in 1891. For eleven years he tested all applicants for employment, being admirably fitted by temperament, experience and ability to perform these important duties with due regard for the interests of the company, and with sympathetic fairness to the applicant.

The same year that he arrived in New York, Mr. Howell joined the Telegraphers Mutual Benefit Association. This early action on his part was typical of his attitude toward every organization or agency for the improvement and advancement of the interests of those engaged in the telegraph service throughout the forty-two years of his close and intimate relation to its personnel. He was a charter member of the Magnetic Club and a member of the Old Time Telegraphers and Historical Association. He was one of the organizers of the Telegraphers Aid Society in 1885, and was largely responsible for the organization of the Relief Fund established for the benefit of those physically disqualified for membership in the Aid Society. He was a trustee of the Relief Fund from the beginning.

He was a charter member, and one of the active organizers of the Serial Building Loan and Savings Institution organized in 1885 and served as vice-president until 1890, when he was elected secretary and held that office continuously till the time of his death. He was also secretary of the Bedford Co-operative Building Loan Association of Brooklyn from 1898 to 1918.

About fifteen years ago he organized the Commonwealth Bank of Brooklyn and became its President. The Bank did business for a short time, and was then disbanded.

It was in the field of co-operative building loan association development that Mr. Howell found his life work. He brought to this great work an untiring zeal and an unquenchable enthusiasm. All the resources of his keen and analytical mind were brought to bear upon the problems of these associations. For years he was the unwearying advocate of legislation to strengthen the control of the State banking department over building loan associations in order that unscrupulous promoters masquerading under the name of Building Loan associations might be driven out and legitimate associations be safeguarded and strengthened. After years of effort the desired legislation was secured, and as chairman of the legislative committee of the metropolitan and State leagues he drafted much of the present State Banking Law relating to building loan associations. He was vice-president of the United States League of Building Loan Associations, and in the building loan movement throughout the city, the state and the nation he enjoyed a position of commanding influence for many years.

In 1914 he organized, and became the managing director of the Land Bank of the State of New York. The Land Bank is an institution to enable building loan associations to extend their operations by loaning them money on the deposit of their mortgage securities.

His prominence and standing in the loan association field led to his appointment by Gov. Glynn as New York State delegate to the second national conference on market and farm credits held at Chicago in April, 1914, and also resulted in his being invited to Washington by the President in 1917 to confer with the treasury department on the land credits bill.

Mr. Howell was always a doer of the word and not a hearer only, in religion as in everything else. He was a vestryman and treasurer of St. James Protestant Episcopal Church in Brooklyn, and a friend and adviser of the Rector and people of St. Phillips P. E. Church in Dean Street, a congregation of colored people.

His association with the telegraph did for Mr. Howell what it has done for so many others—afforded him opportunity for a large measure of self-education and gave him a broad and generous outlook on life and its responsibilities. He was well informed on many subjects, and always took a keen interest in public questions and discussions.

Had Edwin F. Howell known how to be selfish and had his integrity been less rugged than the rock-bound coast of his native land, he would no doubt have died a rich man, but he chose rather that good part that cannot be taken away, and at the comparatively early age of sixty-five years, he ceased from his labors, respected, admired and loved by a multitude whose lives were enriched and ennobled by his lifelong ministry of friendship and unselfishness.

France Taxes Cablegrams.

Announcement was made on February 2, that the French Telegraph Administration has decided that all foreign messages originating in France shall be taxed 55 centimes per franc in addition to the regular tariff. This tax will result in the collection of a considerable amount of additional national revenue, but will also tend to reduce somewhat the volume of traffic.

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THE STORY OF THE TELEGRAPH

Including

SUBMARINE CABLES AND RADIO TELEGRAPHY*

In the year 1844, at the time the present system of electric telegraphy was introduced, and fourteen years later when Europe and America were joined by telegraph cable great civic honors were accorded the scientific pioneers who perfected these systems of long distance communication.

In the great speeches delivered by the gentlemen present at these memorable celebrations the main thread of thought,—almost a prayer—running through the remarks of all speakers was that the telegraph would prove to be a harbinger of universal peace, friendship, and civilization.

That the hopes of those who were here to welcome the advent of the telegraph have not in full been realized, surely should not be charged to some unsuspected quality or property of the new art; but rather should we understand that a wide enough span has not as yet intervened between the date of discovery and our own times for the art to work out its true destiny.

As the investigator gropes back through the attenuated records of the past in search of the birth of the idea of the telegraph he is perplexed by the many attempts previously made to lay finger upon the genesis,—the origin of the telegraphic idea.

The inspired author of the Book of Job exclaims in an interrogatory, framed to suggest the impossible, "Can'st thou send lightnings that they may go, and say unto Thee, here we are?"

Surely the scientists of our own times — the nineteenth century—have given the answer, and we are now able to "send lightnings" where we will and when we will.

Were it sensible to attribute to speculative fancy the beginning of any achievement or accomplishment which should ultimately have practical value, then we may say that John Baptista Porta, an Italian prodigy (1575) has claims which entitle him to recognition in telegraph history. In one of his published works Porta says: "To a friend, that is at a far distance from us, fast shut up in prison, we may relate our minds; which I do not doubt may be done by two mariner's compasses having the alphabet writ upon them."

Von Guericke, of Magdeburg (1655) observed the transference of electricity through a conductor (a linen thread an ell or more long) antedating by twenty years the work along similar lines, of Boyle, Newton, and Hauksbe, in England.

In 1726, Wood, in England, discovered that electricity may be transmitted through long metallic conductors, and twenty years later Dr. Watson, in England, actually transmitted electric impulses over a circuit two miles in length.

In the year 1753, Charles Marshall, of Scotland sent to the *Scot's Magazine,* a communication which contained the earliest recorded reference to an electric telegraph, and as the telegraph was the forerunner of all electrical activities, historians of electrical development in all civilized countries have in hundreds of instances made reference to the article which appeared in the February, 1753, issue of this magazine.

The article states, in part: "It is well known to all who are conversant in electrical experiments that the electric power may be propagated along a small wire, from one place to another, without being sensibly abated by the length of its progress; let, then, a set of wires equal in number to the letters of the alphabet be extended horizontally between two given places parallel to each other and each of them about an inch distant from that next to it. At every twenty yards' end let them be fixed in glass or jewelers' cement to some firm body, both to prevent them from touching the earth or any other non-electric, and from breaking from their own gravity." The writer then goes on to explain his proposed method of operating the telegraph whereby bits of paper bearing the letters of the alphabet are placed an eighth of an inch below suspended metallic balls at the receiving end and are attracted thereto as each wire is electrically charged from the distant station. Thus by observing the letters affected the receiving operator may form the words of the message transmitted.

After the publication of the "C.M." article nearly a quarter of a century elapsed before the first method of electric telegraphy was tried out, namely, that of George Louis LeSage, of Geneva. Moigno writing in 1852, Sabine in 1867, and Taylor in 1879, all state that LeSage actually established his telegraph system at Geneva in the year 1774.

Le Sage's method of telegraphing was almost identical with that suggested by "C. M." in the *Scot's Magazine,* previously mentioned.

Then followed the telegraph experiments of Lomond, in France (1787), Claude Chappe, in France (1793), M. Reusser, in Switzerland (1794) Caballo, in England (1795), Salva, in Spain (1798), Soemmering, in Bavaria (1807), Schweigger, in Germany (1815), and Francis Ronalds, in England (1816).

In chronological order the next noteworthy attempt made to devise a system of telegraphy was that of Harrison Gray Dyar, of New York, in the year 1828. An account of Dyar's experiments is

*From "The Story of Electricity," Vol. 1, by T. C. Martin and S. L. Coles.

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interesting; first, because his ill-fated invention was the first telegraph tried in America, and because his system was the last of the long line of telegraphs which were dependent upon frictional electric machines as sources of current.

About the time Dyar was making his telegraph, Sturgeon, in England, and Joseph Henry, in America, were experimenting with electro-magnets,—those obedient and tractable little helpmates which were destined to provide us with a real telegraph system, and to revolutionize mechanical motion. Also, a year previously (1827) Ohm's Law had been announced.

Dyar's telegraph was of the electro-chemical order, being operated by sparks produced by a friction machine,—the sparks being spaced and regulated by a pendulum. There is no evidence to show that an actual receiving device was constructed, although Dyar proposed using a litmus-paper receiver as soon as the experiments made a transcribing device necessary. The experiments were conducted on Long Island over a great length of wire strung around the race course, and were satisfactory to the extent that he showed that sparks made at one end of the circuit could be observed at the other end of the wire. Presumably a metallic circuit was used as no mention is made of the use of a ground return. In erecting the poles and wire, Dyar was aided by a Mr. Brown of Providence, R. I., the legal side of the undertaking being in the hands of a Mr. Connell, of New York. As soon, however, as the experiments were well under way, Connell brought suit against Dyar for twenty thousand dollars, and although the case was dismissed, John F. White, Dyar's patent attorney notified him that Connell had secured a writ against Dyar charging conspiracy against the government for attempting to carry on secret communication between cities. Dyar forthwith abandoned his experiments and left the state in order to escape prosecution.

The important discoveries in electro-magnetism made by Oersted, in Denmark (1820), Faraday, in England (1823), Sturgeon, in England (1824), and Henry, in America (1827), speedily brought to the front entirely new ideas and agencies from which a practical system of telegraphy might be constructed. It is true, of course, that the operation of lines over considerable distances was not efficiently practicable until economical and reliable primary batteries were brought out. The primary cells introduced by John Frederick Daniell, in England (1836), and by William Grove, in England (1837), supplied the missing link and from that time onward practical telegraph systems were rapidly introduced, and extended to meet social, governmental, and commercial requirements in all civilized countries.

In devising telegraphs the earliest use made of the principles of electro-magnetism was in connection with what is known as "the needle system." Baron Schilling, in Russia (1832) exhibited a method of signaling, employing thirty-six deflecting needles. Gauss and Weber, in Germany, erected a metallic circuit about two miles long (1833), the received signals being indicated by freely suspended needles. The practical development of this system was taken up by Steinheil who in 1837 had several miles of line in operation in Bavaria. Steinheil devised a receiving arrangement employing bells of different pitch to indicate the letters of the alphabet. Steinheil's chief claim to fame rests upon his discovery made in the year 1837 that the earth could be used as the return portion on an electrical circuit.

In England, in the year 1837, Edward Davy exhibited a telegraph system employing deflecting needles to indicate the received signals, and in the same year Cooke and Wheatstone, in England, procured an English patent (June 12) for a needle telegraph system employing six wires and five deflecting needles. (The American patent was granted June 10, 1840.)

We now arrive at the point where we may truthfully transfer the scene of telegraphic activity and invention from Europe to America.

During the past forty years various desultory attempts have been made purporting to establish the view that Joseph Henry, and not S. F. B. Morse, invented the system of electric telegraph universally known as the Morse Telegraph System.

Henry's exemplary life and his profound writings vividly remind one of the life and work of his great English contemporary, Michael Faraday. Scientific history unreservedly accords to Henry the honor of being the first to devise electro-magnets of a useful type; but there is plenty of evidence to show that he did not at first think much about or concern himself with the development of electric telegraphy.

The thing Henry did which has misled some of his biographers was to suspend around the walls of the upper rooms in the Albany Academy a circuit consisting of a mile of copper wire in which was connected a primary battery and an electro-magnet. A permanently magnetized steel rod was mounted on a pivot (like a compass needle) and situated in such position relatively to the electro-magnet that one extremity of the rod could play between the polar extremities of the magnet. Near the other end of the steel rod the gong of a small office bell was placed. When the current from the primary battery was sent through the circuit in one direction the rod was attracted into contact with one pole of the magnet resulting in the opposite end of the rod striking the bell, thus giving a signal. When the current was reversed through the circuit the rod was attracted to the other pole of the electro-magnet, again causing the gong to be tapped. These demonstrations were made in the year 1832.

Morse's first idea of the telegraph came to him in the year 1832—he was then forty-one years of age—while he was on board the packetship *Sully*, sailing from Havre, France, to New York. A fellow passenger—Dr. Charles T. Jackson—one day at the dinner table discoursed upon the advances which had recently been made in the science of electricity, explaining the method of increasing the

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power of a magnet by passing electric current through convolutions of insulated wire wound upon a soft iron bar. The speaker stated that electricity was known to travel through great lengths of conducting wire, practically instantaneously; whereupon, Morse, who was present, propounded the question "If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted instantaneously by electricity."

Morse was a portrait painter, not a scientist, and from his question, above quoted, it may be understood that his first vision of the possibilities of electricity disclosed to his practical mind the growing need for a system of transmitting intelligence,—possible then because of discoveries and agencies already at hand.

Nothing short of inspiration could have given Morse his original broad conception of the ultimate utility of a system of instantaneous communication, and the way he overcame subsequent trials and discouragements while gathering up the elements of a workable system proved that he had unlimited faith, not only in ultimate technical success; but also in the meed certain to be awarded the first in the field with a practical system of electric telegraphy.

There were in the world at that time a number of eminent savants much better equipped than Morse was to solve the problem: In France, Peltier, Arago, De La Rive, and Ampere; in England Faraday, Sturgeon, Cooke, Wheatstone, and Ronalds; in Russia, Jacobi, and Schilling; in Germany, Ruhmkorff, Lenz, Steinheil, Ohm, and Soemmering; in America, Joseph Henry, Page, Silliman, Day, and Frisbie.

In scientific history these men all are famous as the foremost scientists of their times, and most of them were in the hey-day of manhood at the time the artist Morse by patient but perservering labor gave to the world the crowning electrical achievement of the century.

The fact that the five years intervening between October, 1832 (the date of the Morse-Jackson conversation on board the *Sully*) and November, 1837, were consumed by Morse in studying the requirements and in constructing the first crude apparatus, but calls attention to the fact that there was an extended opportunity afforded others who may have been better informed electrically, or who may have had the means necessary to carry on experiments. That others did not, during this period, overtake and pass Morse in the march toward the goal of success points to the conclusion that Morse, and Morse only, had a true understanding of the entire problem.

When Morse arrived in New York from Europe, November 15, 1832, he at once set to work experimenting along lines suggested in numerous sketches and diagrams which he had recorded in his note book while on ship-board, but owing to lack of funds and to inadequate shop facilities it was not until 1835 that he was able to assemble a working model embodying his ideas. By September 2, 1837, he had succeeded in building two sets of instruments,—one for each end of a circuit, and on that date gave a public demonstration of his invention in the great hall of New York City University, where he was employed as a professor.

It was on this occasion that Morse had the good fortune to meet Mr. Alfred Vail, son of Judge Stephen Vail, proprietor of the Speedwell Iron works of Morristown, New Jersey. Alfred Vail was then thirty years of age and had recently graduated from the University of the City of New York. Upon witnessing Morse's telegraph demonstrations in 1837 Vail became intensely interested, and learning that Morse was in need of capital, and of mechanical assistance, undertook to induce his father to furnish financial backing for Morse's enterprise, and himself agreed to take up the work of constructing improved apparatus at Speedwell.

Morse's caveat was filed in the patent office at Washington, October 6, 1837, and his application for letters patent was filed April 7, 1838.

On Novmber 28, 1837, Morse advised the Secretary of the Treasury at Washington—with whom he had had previous correspondence regarding the telegraph—that he had succeeded in operating a telegraph circuit ten miles in length.

From the year 1837 until 1842, Morse's time was taken up procuring patent protection in European countries, giving exhibitions of his system in the large cities in this country, and in perfecting details of the mechanism of the telegraph. Also, during these years a continuous effort was made to induce the American government to make an appropriation to defray the costs of establishing an experimental line of telegraph between two of the eastern cities. In December, 1842, Morse was persuaded to make one more application to Congress, and on March 3, 1843, a bill appropriating thirty thousand dollars to aid the enterprise passed through the House by a close margin.

Plans were immediately made to construct a line between Washington and Baltimore, the conductors to be laid underground between these points.

Ezra Cornell, later the founder of Cornell University, was engaged to take charge of the conduit work, leaving New York for Baltimore on October 17, 1843. The conductors consisted of four insulated No. 16 copper wires inclosed in a lead pipe which was laid in a trench between the double tracks of the Baltimore and Ohio Railroad extending between Washington and Baltimore.

Early in the year 1844 it was discovered that the conductors in the pipe were badly mixed, after about ten miles of the underground system had been constructed. The underground scheme was then abandoned and the wires strung on poles.

On May 24, 1844, the famous "first message" "What hath God wrought!" was sent over the line from Washington.

The Washington-Baltimore line was regarded, for a time, as government property, and on May 15, 1845, a charter was granted for the first private

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commercial telegraph line in America, The Magnetic Telegraph Company.

In the meantime in Europe, needle telegraph systems, dial telegraph systems and electro-chemical telegraph systems had been established; but most of these methods of telegraphing later were displaced by the Morse system, or modifications of the same.

(To be continued.)

Relic of the Collins' Overland Telegraph Venture.

With the failure of the transatlantic cable of 1858, American telegraph interests for a time despaired of being able to lay a cable across the ocean which would remain operative for any considerable length of time. The Western Union Telegraph Company backed an enterprise which had in view building a land line from San Francisco along the Pacific Coast, through British Columbia to a point on the North American side of Behring Straits. The idea was to lay a short submarine cable across the Straits which would connect with the land line system terminating at a port in Asiatic Russia. The famous Pope brothers, F. L., and Ralph W., American telegraph engineers, were identified with the building of the lines which were completed. The success of the laying of the 1865 transatlantic cable caused the enterprise to be abandoned.

F. W. Dowling, superintendent of the Dominion of Canada Telegraphs, located at Prince Rupert, B. C., recently on an official inspection of government telegraph lines through British Columbia and northward, came into possession of an interesting relic of the Overland Company's operations of fifty-five years ago. It is in the form of a telegram written on one of the company's blanks, dated November 23, 1865. The message was one transmitted from Soda Creek, B. C., to Quesnel, B. C. The message was copied by hand in the clean, flowing copy of the old-time telegrapher.

Telegraph and Telephone Systems in Honduras.

The telegraph and telephone lines of the government of Honduras represent an investment of about $600,000. The length of the telephone line is 1,015 kilometers and the telegraph line, 7,287 kilometers. On January 1, 1919, there were 271 telegraph offices, 372 telegraph instruments, and 512 telephones under government operation. The telephone equipment is American, the switchboards being of the magneto type. Purchases for the telegraph and telephone lines amounted to $12,248 in 1917–18 and to $21,320 in the previous year. Consul C. K. Donald, at Tegucigalpa, states that there is only one private line of importance in his district, that being American equipped and consisting of 150 lines and about 45 miles of wire. (Refer to File No. L. A. 37 for the names of possible purchasers of telephone and telegraph equipment in Honduras.)

Telephone Texts in Scriptures.

The *Bell Telephone News* publishes a list of texts contained in the Bible which could be construed as pointing to the invention and operation of the telephone. We reproduce a few of them herewith:

Their line is gone out to all of the earth and their words to the end of the world.—Ps., xix., 4.

We have no might against this great company.—II Chron., xx., 12.

Now, shall this company lick up all that are around about us?—Num., xxii., 4.

The great city was divided into three parts.—Rev., xvi., 19.

Charge the people!—Exodus, xix., 21.

Is here any number?—Job, xxiv., 3.

The number is 666.—Rev., xiii., 18.

When I call, answer me speedily.—Ps., cii., 2.

Where is the receiver?—Isa, xxxiv., 18.

They could not take hold of his words.—Luke, xx., 26

I said in my haste "I am cut off."—Ps., xxxi., 22.

If he cut off, and shut up, who can hinder him?—Job, xi., 10.

I will cut him off.—Lev., xxvii., 10.

Rebuke the company—Ps., xviii., 30.

What word is this!—Luke, iv., 36.

Thou hast nothing to pay.—Prov., xxii., 27.

Wherefore kick ye?—I Sam., ii., 29.

Twenty and three!—Judges, x., 2.

Bound Volumes of "Telegraph and Telephone Age" for 1919 Now Ready.

We now have ready for delivery bound volumes of TELEGRAPH AND TELEPHONE AGE for the year 1919. These volumes are bound in serviceable cloth covers with the magazine title and year on the back.

The twenty-four issues of TELEGRAPH AND TELEPHONE AGE for the year 1919 contain a large amount of technical matter relating to telegraphy, telephony, radio telegraphy and submarine cables. No technical library is complete without a copy of this book. The price for the complete year is $4.00; carrying charges 50 cents extra.

Address orders to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

COMMERCIAL TELEGRAPH SUPERINTENDENTS WHO RECOMMEND TO MANAGERS AND OTHER EMPLOYEES IN THEIR DISTRICTS THAT THEY READ TELEGRAPH AND TELEPHONE AGE, CONTRIBUTE MATERIALLY TOWARD MAKING EMPLOYEES PERMANENTLY INTERESTED IN THE TELEGRAPH BUSINESS. TELEGRAPH AND TELEPHONE AGE IS AN AGENCY FOR THE GOOD OF THE TELEGRAPH SERVICE, AND IN THIS GREAT WORK THE EDITOR INVITES THE COOPERATION OF ALL TELEGRAPH SUPERINTENDENTS, MANAGERS, SUPERVISORS, CHIEF OPERATORS, AND ASSISTANT CHIEFS.

CLOCKS in France, Algeria and Belgium were advanced one hour at 11 a. m., February 14.

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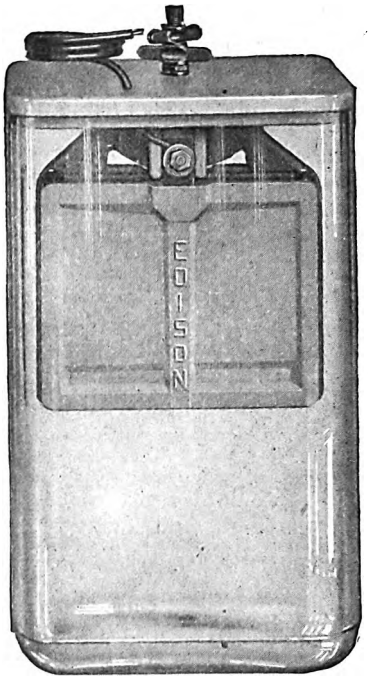
FOR CLEAR TRANSMISSION



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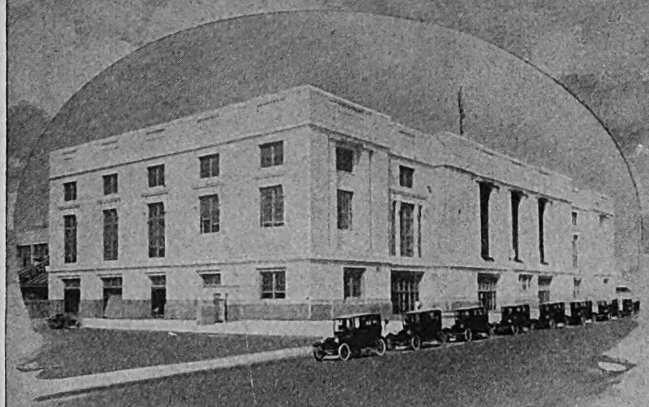

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THE RAILROAD
TELEGRAPH AND TELEPHONE

American Railroad Association.

TELEGRAPH AND TELEPHONE DIVISION.

Chairman J. F. Caskey of the Telegraph and Telephone Division, American Railroad Association, announces that arrangements have been made for a meeting of the Committee of Direction to be held in Chicago on March 16 and 17.

All of the technical committees of the Division are actively engaged in preparing reports which are expected to be ready for printing by June 15.

The next regular meeting of the Division will be held in September, 1920. Unless something unforeseen develops, the meeting will be at Winnipeg, Man.

COMMITTEE NO. 4, Protection Against Lightning, and Electric Light and Power Circuits, I. C. Forshee, chairman, held a meeting in New York on February 17 and 18.

G. H. MAYER, superintendent of telegraph of the Soo Railroad, Stevens Point, Wis., was a New York business visitor on February 17 and 18. He was accompanied by Mrs. Mayer.

Chicago, Milwaukee and St. Paul Railroad.

E. A. Patterson, superintendent of telegraph, Chicago, Milwaukee and St. Paul Railroad, reports the following appointments, effective February 1: H. A. Potter appointed inspector of telegraphs, with headquarters at Milwaukee, Wis.; C. F. Wooten appointed chief operator at Butte, Mont., vice H. A. Potter promoted; E. M. Young appointed district lineman at Murdo, S. Dak.; M. S. Gregory appointed district lineman at Ottumwa Junction, Iowa, vice E. M. Young.

Railroad Telegraph Officials Felicitate Thomas A. Edison.

At a meeting of the superintendents of Telegraph of the various New York Central lines, held at Buffalo, February 11, on account of that date being the seventy-third birthday of Mr. Thomas A. Edison, the following message was sent to him at East Orange:

"The New York Central lines superintendents of telegraph in meeting assembled at Buffalo, on this your seventy-third birthday, extend to you, the most eminent member of the craft, our '73'." Signed: E. C. Keenan, New York Central Lines; J. J. Ross, Michigan Central; A. B. Taylor, New York Central Lines East; R. F. Finley, New York Central Lines West; C. S. Rhoads, Big Four; W. L. Connelly, C. I. & S.; L. A. Lee, Pittsburg & Lake Erie; G. A. Kirley, Boston & Albany; Stanley Rhoads, Engineer, New York Central Lines; B. J. Schwendt, Toledo & Ohio Central; J. G. Gilgrist, Big Four.

THE SPENCE ELECTRIC COMPANY'S loud speaking telephone business has been consolidated with the Stanley and Patterson Company, New York. J. L. Spence, long and favorably known in the loud speaking telephone business, becomes manager of the loud-speaking telephone department of the company. A. R. De Veau, for many years identified with the telephone manufacturing business, is secretary of the company.

Single Line Repeater.

The single line telegraph repeater manufactured by the Jester-Cooper Company, Houston, Tex., is being used successfully on several large railroad systems and in commercial telegraph service.

The management of this repeater is as simple as that of an ordinary single relay and sounder set, with which all telegraph operators are familiar. No local battery is required in its operation.

IN the year 1882, Professor Dolbear was awarded a United States patent covering an electrical system of signaling without the use of connecting wires between stations.

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RAILWAY ELECTRIC MANUFACTURING CO.

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QUESTIONS AND ANSWERS

Phonograph Records.

R. C. J.—A twelve inch phonograph record, with the record groove not closer than two and one-fourth inches from the center hole, has an impression track of about 244 yards. As the needle follows the hills and dales of the record the distance is about twice 244 yards, or 488 yards. The average speed of the needle is 31.8 inches per second. A fundamental note on middle C gives about eight vibrations per inch.

Lamp Resistances.

J. S. K.—A 50-watt tungsten lamp has a resistance, hot, of 266 ohms, which means that a current of .45 ampere flows through it. The battery motor you have and which it is desired to operate from 110 volt mains should be connected in series with lamp resistance, not in multiple. A 75-watt lamp, having 162 ohms resistance and passing a current of .68 ampere should operate the motor; but possibly a 100-watt lamp, passing .9 ampere would be better, provided there is not too much sparking at the commutator. The lamp resistances are the same with either alternating current or direct current.

Single Conductor Telephone Cable.

G. H. C.—Yes, single conductor submarine cables were used in telephone work in the early days of the business. One of the earliest cables of this type laid was that across the St. Lawrence River between Ogdensburg, N. Y., and Prescott, Ont., about one and one-quarter miles. This cable was laid about 1882, and remained in service many years, serving as a section of a toll circuit 100 miles or more in length. The earth was used as a return path.

The Johnson Coil.

W. W. H.—The mysterious looking little tin box which you have observed connected to pole-changers in duplex sets, by means of three wires, does not contain a differentially wound coil, as might be supposed. It is a spark killing arrangement known as a Johnson coil, having been invented by C. A. Johnson of Meadville, Pa.

It consists of a wood bobbin, upon which are wound three separate windings of insulated wire not in electrical contact with each other. When one of these "boxes" is used to prevent, or at least to reduce, the sparking at pole-changer contact points in duplex operation, one wire is connected with the pole-changer armature, one with the closed pole, and one with the open pole of the instrument. The inductive relation of the three windings absorbs the energy which otherwise would cause sparking at the points.

Radio Questions.

H. S. M.—Answering your questions in the order submitted: In the main, the reason for employing a loose-coupler is to provide a degree of selectivity. Your ideas are correct in regard to the necessity for a loose-coupler for receiving long waves or waves of a given length. The wide use of the honeycomb type of receiving inductance unit shows that many others have reached the same conclusions you have. An auto-transformer would serve the purpose all right if designed for the purpose, but you would still require a variable condenser in the detector circuit.

A variable voltage is not absolutely necessary with the Marconi bulb, but in practice it is found that it is of value to be able to raise or lower the potential.

In regard to the wave length of an antenna, the figure of four and one-half times the length of the wire, which you give, is a little low. The fundamental wave length of the antenna is approximately five times the length of one of its symmetrical elements measured along the wire from the ground to the open tip. A formula for wave length is:

$$\text{Wave length} = 59 .6 \sqrt{C L}$$

C, representing capacity in microfarads, and L, inductance in centimeters.

S. O. S!

WILL YOU ANSWER THIS CALL?

ADVANCEMENT and BETTER PAY are AWAITING those who take up the study of Electricity.
THE NEW YORK ELECTRICAL SCHOOL instructs you in the PRACTICAL and THEORETICAL elements of electricity. You acquire BY ACTUAL PRACTICE and EXPERIENCE the art of Electrical Drafting, the most efficient business methods of Electrical Contracting, together with the skill to install and operate all systems for producing, transmitting and using Electricity.
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TELEGRAPH AND TELEPHONE ENGINEERS HOLD MEETING.

The midwinter convention of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York, February 17-18-19. The afternoon session of February 19, was in charge of the Institute's Telegraphy and Telephony Committee, and two important technical papers were presented; one by John H. Bell, telegraph engineer, Western Electric Company, New York, entitled "Printing Telegraph Systems," and one by Dr. George A. Campbell and Ronald M. Foster, of the research department, American Telephone and Telegraph Company, New York, entitled "Maximum Output Networks for Telephone Substation and Repeater Circuits."

On account of the large attendance of telegraph and telephone engineers at the convention the main auditorium was used for this meeting. Vice-President Wills MacLachlan, of the Institute, presided. The introduction of the speakers and the conducting of the discussion was in charge of Donald McNicol, chairman of the Telegraphy and Telephony Committee of the Institute.

Mr. Bell's paper described the Creed, Murray Automatic, Siemens and Halske, Baudot, and American Multiplex Telegraphy systems. The operating features of the various systems were described under the following heads:

Accuracy—Under this head it was shown that printing telegraph systems are more accurate than Morse working and that the printing telegraph system which permits of sufficient time for checking messages is likely to be the most accurate.

Speed of Service—The paper described wherein the multiplex systems are superior to the "high speed" systems, so-called.

Operator Output—Under this head reference was made to actual results in service both in this country and in Europe.

Maintenance—Proposed methods for detecting incipient faults in apparatus and securing uninterrupted service were outlined.

Flexibility—Examples were given of the flexibility of multiplex systems in linking up a number of cities, by means of forking repeaters, thereby resulting in either line or operator economies.

This paper was very thoroughly discussed by engineers present, including Paul M. Rainey, Charles E. Davies, H. A. Emmons, G. R. Benjamin, J. P. Edwards, A. J. Eaves, R. E. Chetwood and E. R. Shute. Major General George O. Squier, who was present, discussed printing telegraph systems from the viewpoint of their availability and usefulness in military service, and General Edgar Russel delivered an interesting talk on the employment of the American multiplex printer in France during the late war.

Dr. Campbell's paper on telephone repeater circuits, although largely mathematical, was received with a great deal of interest, and in the discussion which followed contributory remarks were made by O. B. Blackwell and Lloyd Espenschied.

It is a noteworthy development of Institute activities during the past few years that technical papers dealing with subjects related to telegraphy and telephony never fail to draw a large attendance of engineers to the meetings. The growing recognition of the importance of electrical communication, together with the steadily increasing number of engineers engaged in telegraph and telephone work have resulted in these subjects receiving attention equal to that accorded other branches of the electrical industries.

Use the Ocean Gently.

One cannot be too careful about dropping things into the ocean, especially heavy things. This was demonstrated when, in replacing a buoy one morning in September 1907, a boatswain of the United States Navy dropped overboard from a boat an anchor weighing several tons.

The place where he dropped it was a Guam Island harbor channel several hundred feet wide and over a hundred feet deep. Now, compared with such dimensions, a cable, even an ocean cable, is but a thin thread. Yet the heavy anchor dropped squarely on that cable and crushed it against the hard coral rock of the bottom, effectually cutting off communication by that wire.

It took months of time, a mile and three-quarters of new cable, and the services of a repair ship and its crew, to make the necessary repairs.

The Court of Claims thought it was a good case for the collection of damages from the government, and the Senate Committee on Claims has now, after thirteen years, reported a bill to pay the Commercial Cable Company its claim of $35,894.—*Wall Street Journal, New York.*

The Psychology of Message Delivery.

The story with the above title, which was published in our February 16 issue has called forth a considerable amount of favorable comment. Delivery departments in telegraph offices in all parts of the country are practicing Sherlock Holmes stunts in effecting quick deliveries of telegrams which are received for delivery with obscure addresses.

P. C. Kullman, well known New York stock broker, in a letter on the subject calls attention to the fact that the post office service has similar difficulties in delivering mail letters with incomplete or inaccurate addresses. He submits a list of thirty addresses on letters received by his firm in which the addresses in some particular, is different in each instance.

RAILROAD TELEGRAPH SUPERINTENDENTS WHOSE CHIEF OPERATORS AND ASSISTANT CHIEFS ARE REGULAR READERS OF TELEGRAPH AND TELEPHONE AGE, TELL US THAT THESE MEN TAKE A PRIDE IN BEING UP TO DATE. EVERY RAILROAD TELEGRAPH MAN IN THE UNITED STATES AND CANADA SHOULD BE A SUBSCRIBER. THEY GET A BIG TWO DOLLARS' WORTH.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY.

R. D. PAULIN, assistant traffic manager, Western Union Cable System, London, England, is in New York for a few weeks on a business trip.

F. E. D'HUMY, central office engineer, left New York on February 11, on a trip which will include inspection at Albany, N. Y., Cleveland, Ohio, and Chicago.

THE OFFICE OF W. J. Blenheim, traffic manager, Western Union Cable System, has been moved from No. 62 Broadway to the new cable building on Broad Street. It is expected that the operating department will be transferred within a few weeks.

T. W. CARROLL, general manager, has returned from an inspection trip to offices throughout the New England States. He reports traffic conditions satisfactory and that officials and employees at all points are enthusiastic over prospects for an increasing volume of business.

THE OFFICE STAFF in the general manager's office held a valentine party after hours on February 14. Refreshments were served and valentines were exchanged. Miss Florence Drewes received especial honors.

R. F. HAGGERTY, until recently employed in the district superintendent's office at Manchester, N. H., has been transferred to the general manager's office, Eastern Division, as office manager.

CHARLES E. DAVIES, superintendent of traffic, Great North Western Telegraph Company, Toronto, Ont., was a New York business visitor on February 19.

E. A. BAIRD is city superintendent at Syracuse, N. Y.

PLANS are under way for holding an inter-city bowling tournament between Western Union teams on a date in March to be announced later. It is expected that teams in New York, Chicago, San Francisco, Omaha, Denver, Atlanta and Dallas will compete. The Western Union Bowling League, of New York, is now conducting contests, and the names of the winners will be announced soon. The tournament will be for the possession of the Carlton Cup, the prize donated by President Carlton of the Western Union Company.

New York Western Union.

THE CHECKERS CHAMPIONSHIP CONTEST is now under way. Messrs. T. M. Hasten and E. D. Pitt of the division traffic office are in the lead for first place. When these two gentlemen play a game in the rest room during the lunch hour Colonel I. D. Hough is generally on hand to see that all the rules of Hoyle, Queensbury and of the Regular Army are properly observed.

F. H. MINNICK reports the arrival of a daughter in his home.

THE SERVICE SOCIAL CLUB of Local No. 109, Association of Western Union Employees, held its annual ball on January 24 at Leslie Hall, 83d Street and Broadway. The officers of the club are P. La Placa, president; Miss E. Simpson, vice-president, and R. Jablin, secretary-treasurer.

THE WIRE CLUB OF NEW YORK held a beefsteak dinner at Castle Cave, 271 Seventh Avenue, on February 14. The affair was for members only, and all who attended report that the occasion was one long to be remembered. The officers of the Club are: H. M. Heffner, president; Paul Eley, vice-president; F. S. O'Connor, secretary and J. Gschwind, treasurer. The Board of Managers consists of George C. Gute, Col. I. D. Hough, C. W. Samuels, W. R. Lawrence and W. R. Taylor.

IN THE NEW YORK MAIN OFFICE has been started a system of performance pennants, the display of which indicates the circuit or group of circuits showing the largest traffic output. The colors of the flags are white, green and yellow. The pennants are made of stiffened cloth, in size approximately two feet in length and triangular-shaped, and are attached to staffs which may be mounted on the belt message carriers above the circuit designated. White represents first place; green, second place, and yellow, third place. The enthusiasm inspired by these performance pennants is such that quite naturally the flags change locations in the big operating room quite frequently.

Philadelphia Western Union.

T. B. KINGSBURY, city superintendent, Philadelphia, has as his aids a thoroughly enthusiastic and efficient staff. The official and semi-official roll includes: H. D. Wegner, cable manager; E. H.

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Shriner, commercial agent; W. M. Phillips, commercial agent; R. G. Angney, office manager; E. J. Fitzmaurice, chief bookkeeper; J. T. Sheldrake, manager credits and collections; C. H. Beckworth, cashier; B. H. Rivise, supervisor of deliveries; M. C. Niepling, supervisor of service; W. A. Dill, supervisor of timekeeping bureau.

PLANS are in progress for the opening of new offices in the Real Estate Trust Building, and the Witherspoon Building, Philadelphia. Improving the accomodations to the telegraphing public and to business interests is reflectd in a constantly growing volume of business.

FRANK B. BROWN, supervisor in the complaint bureau, was married recently to Miss Lillian Murray.

EDNA J. KROBOTH, stenographer in Superintendent Calvert's office, was married recently to Alfred G. Homan, engineer in the service of the Bell Telephone Company.

MRS. W. M. PHILLIPS, wife of W. M. Phillips, commercial agent, died in St. Josephs Hospital on January 30, after a prolonged illness.

Buffalo, N. Y., Western Union.

WILLIAM M. WALSH, formerly chief clerk to Superintendent A. Woodle, has been appointed manager at Niagara Falls, N. Y.

WILLIAM BARNFATHER, repeater chief operator, who has been laid up with a serious illness for some time, is now recovering satisfactorily.

JOHN A. PFERD, former manager, and Thomas A. Laird, former wire chief, both now retired, and who have been ill with the grippe are reported on the road to recovery.

WILLIAM WALKER, aged sixty-three years, in the company's service thirty-nine years, died on February 17. Mr. Walker has been a repeater chief in the Buffalo main office over a period of twenty years, and was president of the Telegraphers' Aid Society of Buffalo.

THE BUFFALO ELECTRICAL AID ASSOCIATION, at its thirty-second annual meeting, held recently, elected the following officers for the year 1920: W. J. Savage, president; W. J. Quinn, vice-president; R. B. Ferguson, secretary-treasurer. The Executive Committee consists of F. J. Diener, J. J. Kennedy, Miss L. Deming, F. J. Kickler, W. A. Whitehead, Miss W. A. Farrell and Miss Ella E. Chandler. The trustees are John A. Pferd, Joseph Drexilius and John G. McNerny; and the Auditing Committee of J. Cunningham, William T. Fraser and E. J. Weick. The association was organized in the year 1888. It now has a membership of four hundred, and cash on deposit amounting to $5,345.50.

Western Union Lake Division.

AN INDEPENDENT OFFICE has been established at Clinton, Ind., with R. Bidgood as manager. An office has also been opened at Hastings, Mich., with G. I. Goucher as manager.

J. W. HOFFERTH has been appointed manager at Cheboygan, Mich.

C. E. MCCLISH, chief operator of the office at Jackson, Mich., died of pneumonia in that city on February 12.

GEORGE DYER, general superintendent of the Lake Erie and Western Railroad, died in Indianapolis, Ind., on February 2. Mr. Dyer entered the service of the Western Union Telegraph Company in 1885 at Adrian, Mich. Later he entered the railroad service and was employed as dispatcher, chief dispatcher, superintendent, and finally as general superintendent. E. L. Dyer, manager for the Western Union Company at Lafayette, Ind., is a brother of the deceased.

S. R. CROWDER, of the engineering department, New York, accompanied by J. J. Welch, division traffic superintendent, and W. W. Drew, division traffic engineer, visited Cincinnati recently on a tour of inspection.

EDWARD J. HERMAN, forty years of age, operator at Cincinnati, died on February 8, of pneumonia.

GUSTAV SHAPE, seventy-five years of age, one of the pioneers of the service, died at Milwaukee, Wis., on January 28. Mr. Shape had worked as manager and chief operator at various points in the Lake Division. In 1911 he was late night chief operator of the Milwaukee, Wis., office, in which year he was retired on pension.

IN THE WEST ALLIS, WIS., office of the company there is a messenger boy who has a proper realization of the importance of a telegram. He was handed for delivery a telegram addressed in care of a rural delivery post office box. The message was urgent and there would not be a mail delivery until the following morning. The boy started out with the message and soon learned that in order to reach the addressee he would have to walk a distance of seven miles. The day was bitterly cold, but the youngster buttoned up his coat, pulled his cap over his ears and started across country, delivering the message within two hours. This is the type of messenger boy who ultimately reaches official position in the service.

Chicago Western Union.

THE WESTERN UNION FELLOWSHIP CLUB, now in its second year, gave a dinner in the new company restaurant at No. 427 South La Salle Street on February 9. The guests of the occasion were the various railroad telegraph superintendents located at points within the Lake Division. A program

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of musical numbers was given and several interesting addresses were made by members of the Club and by guests.

ON THE OPENING DAY of the company restaurant in the new telegraph building, 427 South La Salle Street, there was a record attendance of patrons. While the turnover was at its height it was realized that the supply of table silver was insufficient to properly supply the diners. However, at this point Messrs. W. W. Drew of the traffic department and Henry Kline of the general manager's office applied their dispatching knowledge to the situation, and, becoming bus boys, kept the silverware moving to and from the kitchen with such speed that all present were accomodated.

The Perils of the Loop District.

Since the "blimp" disaster of last summer when the big Goodyear dirigible crashed through the skylight of the Illinois Trust and Savings Bank building, killing a number of employees, those who work in offices in the Loop District of Chicago have been prepared for about everything that can happen in the way of excitement and danger. Recently a heavy mail truck traveling east at high speed along Jackson Boulevard skidded into the curb at the Board of Trade corner, shattering a cast iron lamp post, a large fragment of which was hurled across La Salle Street and through a plate glass window into the call-circuit quarters of the Western Union office. Manager J. N. Armstrong, and Misses Helen Reilly and Anna Cupp, call circuit clerks, narrowly escaped serious injury. Mr. Armstrong says the accident caused the biggest noise and the nearest approach to personal damage that he has experienced since he exchanged hardware with the Germans from the trenches in the Argonne.

Detroit, Mich., Western Union.

NEW BRANCH OFFICES have been opened in the Cadillac Hotel, the Joseph Mack building, and in the Owen building. Mary Keller, formerly at the Pontchartrain, has been appointed manager at the Cadillac. Mrs. Jennie Lewis has been appointed night manager at the Michigan Central terminal office.

The Dog Circuit.

Edward Delahanty, in charge of the district service wires in Cincinnati, of the Western Union Telegraph Company, recently was instructed to get after wire trouble on a circuit entering the office at 4th and Walnut Streets. He was told that the trouble was on the "Dog" circuit. Mr. Delahanty was in somewhat of a quandary until he figured it out that the circuit to investigate was K-nine.

DURING the year 1882, Thomas A. Edison applied for 141 patents.

College Boys Deliver Telegrams.

It is stated that at Syracuse, N. Y., students of Syracuse University who need additional income to aid them during their terms in college will be given employment with the Western Union Telegraph Company in the message delivery department. The hours of duty will be arranged so as not to interfere with study periods or class work.

Montreal Telegraph Company's Annual Report.

The Montreal Telegraph Co.'s report for 1919 shows cash, accounts receivable, bonds and other securities as $163,483, and liabilities $132,586. The total assets are given as $2,315,307 against $2,314,411 in 1918. The usual dividends amounting to $160,000, wre paid during the year and the directors were re-elected for this year.

Opportunities for Electrical Students.

At the present time there are openings in New York and vicinity for electrical students who desire to become telegraph, submarine cable or radio telegraph engineers. The positions are particularly attractive to men between twenty and thirty years of age who have a fair knowledge of electric circuits and who wish to identify themselves with work which holds out promise of regular advancement in position and salary. Information may be obtained from the editor of TELEGRAPH AND TELEPHONE AGE.

ANNOUNCEMENT OF IMPORTANCE TO TELEGRAPH OFFICIALS AND TELEGRAPH STUDENTS.

In the March 16 issue of Telegraph and Telephone Age we propose to begin a series of educational articles written with the object of instructing students in the operation and management of telegraph apparatus.

The course is being planned to start at the beginning of the subject so that operators, linemen, and clerical assistants who desire to learn the technical side of the business may start in where the subject is easy to understand. The student will be carried along from elementary circuits to the work which makes up the daily tasks of the men who handle switchboards, repeaters, duplex and quadruplex apparatus, line testing, measurements, etc.

Officials and managers should take advantage of this high grade instruction by calling it to the attention of operators, small office managers, linemen, clerks, and all others in the service who should understand the workings of the instruments used in modern telegraphy.

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POSTAL TELEGRAPH-CABLE COMPANY.

C. A. COMSTOCK, assistant to the general manager, is visiting Cleveland, Ohio, and other Western division offices.

THE PLANT AND ENGINEERING DEPARTMENT is arranging for rooms on the ninth floor, taking space formerly occupied by Isaac Smith, superintendent of tariffs, and by the Commercial Cable Company. The change will be made about the first of May, and will result in grouping the staff of the new department in such a way as to result in greater efficiency. The tariff department will be transferred to quarters now occupied by the engineering department on the seventh floor.

THE LONG DISTANCE telephone service of the company has been extended to Louisville, Ky., that place now having connection with Indianapolis, Chicago, Cincinnati, and other places. The service was inaugurated on Washington's birthday.

New York Operating Department.

THE CITY DEPARTMENT has been transferred from the general operating department to new quarters on the eleventh floor, the move having been made necessary by the expansion of traffic. The new department has been fitted with the most modern equipment in order to expedite the handling of traffic to and from city offices.

THE MANY FRIENDS of Edward P. Duffy are grieved to hear of his death, which occurred suddenly, of heart disease, on February 13. Mr. Duffy, who was formerly an employee of this office, has been connected with the U. S. Shipping Board office in New York for some time.

TWO OF OUR FIRST-CLASS BONUS OPERATORS, A. Auslander and J. F. Colbert, have been transferred to the Cotton Exchange on account of increased business at that point.

GEORGE B. KEENER, of the Albany local, who has been in the hospital with pneumonia, is now recuperating and expects to return to work shortly.

MRS. C. V. HAMMOND has resigned and will leave for the South, stopping first at Birmingham, Ala. Miss M. Thompson has been assigned to her place on the first Buffalo circuit.

M. S. MELVILLE, for many years operator in this office, is now assistant night traffic chief.

DANIEL A. MAHONEY, well known main office operator, is now traffic chief of the southern division.

E. B. HAGGERTY, former assistant chief operator for the Postal Telegraph-Cable Company, New York, is now vice-president of the Fabric Innershoe Corporation of New York, manufacturer of automobile tires.

New York City Notes.

MRS. M. C. MADDEN, of the Hotel Imperial office, died on February 2. She had been an employee of the company for many years and was highly thought of by her fellow employees.

J. F. DUGGAN, formerly manager of the 263 West 125th Street office has been transferred to the office at Third Avenue and 125th Street, vice J. J. Reilly, resigned.

E. F. LIPPOTH has been appointed manager at the 263 West 125th Street office.

MANAGERS APPOINTED: M. J. Merrimon, Statesville, N. C.; Mrs. E. C. Holland, Indiana Harbor, Ind.; F. R. Watson, Nashua, N. H.; W. J. Burt, West Chester, Pa.; J. R. McCleary, Norristown, Pa., R. S. Thornton, Kosciusko, Miss.; J. L. Tucker, Greensboro, Ala.; E. G. Hamel, Tuskaloosa, Ala.; J. F. Jackson, Montgomery, Ala.; E. McGinniss, Sharon, Pa.; A. J. Doherty, Portsmouth, N. H.; C. E. Leonard, Winston-Salem, N. C.; M. B. Harden, Dade City, Fla.; G. M. Forte, Camden, S. C.; Russell Scruggs, Newton, Miss.; M. C. Halladay, Pontiac, Mich.; K. A. Glaser, Piqua, Ohio; S. L. Horton, Vicksburg, Miss.; A. B. Winter, Everett, Wash.; Margaret Gasper, Hastings, Mich.; Edna V. George, Charlotte, Mich., and M. Newhart, Carbondale, Pa.

Seventh District, Eastern Division.

S. G. FITCH, for many years manager of the office at Scranton, Pa., has resigned to accept a position as supervising inspector in the Pennsylvania State Department of Labor and Industry. He is succeeded at Scranton by A. E. Davis, employed as operator in that office for several years.

SIMON SNAPPER has been appointed manager of the office at Norwalk, Conn., succeeding Mrs. Fudge, resigned.

MRS. A. S. BAKER, manager at Stamford, Conn., has been confined to her home for two weeks with a severe cold. George Alberg, of the New York operating department, acted as relief manager.

Albany, N. Y., Postal.

ON FEBRUARY 15, the Albany district was visited by a severe snowstorm. The wires within a radius of ten miles were broken in several places. Trolley service and horse drawn conveyances were abandoned. Our linemen, all of whom are experts on snowshoes and skis, covered the ground in short time and repaired all interruptions to circuits.

Pittsburg, Pa., Postal.

T. J. HOGE has been appointed office electrician of the main operating department. A. J. Hoelzle, assistant quqadruplex chief, has been advanced to

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the position of night general wire chief. C. Connor, assistant traffic chief, has been appointed assistant quadruplex chief, and J. P. Flynn has been appointed assistant traffic chief.

E. McGINNIS has been appointed manager at Sharon, Pa., vice H. D. Robinson, resigned.

BLANCHE MARLAND has been appointed manager at Newcastle, Pa., vice J. Breen.

MRS. L. DENNISON has been appointed manager at New Brighton, Pa., vice Miss Marland.

Philadelphia Postal.

DURING THE YEAR 1919, Philadelphia operators handled 67,000 telegrams for each individual error which developed in copy, the bulk of the errors being of no serious consequence. Morse operation is employed on all wires entering this office.

J. J. OWENS, formerly manager of the branch office at No. 6 North 40th Street, has been assigned to duty in the main operating room. He was succeeded as manager by Joseph Manz.

W. M. THOMPSON, superintendent of the Canadian Pacific Railway Company's Telegraphs, Montreal, Que., was a recent Philadelphia visitor.

THE SUPERINTENDENT'S QUARTERS, as well as the main operating room, was recently renovated, and now looks clean and attractive.

A. G. CARPENTER, office electrician, recently installed a set of automatic repeaters at Pottsville, Pa., to improve the service on the circuit to Hazleton, Pa.

J. A. JEFFRIES, chief service clerk, has the sympathy of the Philadelphia staff in the death recently of his sister, Mrs. J. Faltenbacher.

MARGARET MURPHY, route clerk, was given a party by seventeen of her friends on February 2.

S. L. BARSHINGER, manager of the No. 1936 Callowhill Street office, has the sympathy of his friends in the recent death of his father.

Buffalo, N. Y., Postal.

J. F. HARRINGTON, wire chief of the main office, is confined to his home on account of illness.

MARY GIESEL, manager of a branch office, has been assigned to duty as operator in the main operating department. At the branch she was relieved by Frances Keller.

EDWIN STANSFIELD has been appointed assistant day traffic chief. For several years he has been late night chief operator.

STANLEY WATSON, operator at Watertown, N. Y., has resigned from the service on account of continued ill health.

W. A. STERNER, manager at Jamestown, N. Y., is ill with influenza.

Southern Division.

H. D. BAGGARLY, formerly manager at Montgomery, Ala., has been appointed assistant superintendent of the third district, Southern Division.

J. F. JACKSON, formerly manager at Tuscaloosa, Ala., has been promoted to the managership at Montgomery, Ala.

E. C. HAMEL has been appointed manager at Tuscaloosa, Ala. He was formerly manager at Greenville. Miss J. E. Haines succeeds Mr. Hamel as manager at Greenville.

J. L. MAYO has been appointed manager at York, Ala.

Pacific Division Postal.

At Los Angeles, Calif., the main office management comprise F. S. Fell, manager; H. J. Thompson, chief operator; P. A. Angus, night chief operator; S. B. Runyan, late night chief operator; W. R. Buhland and E. G. Walter, traffic assistants.

At Portland, Oregon, the staff consists of John Annand, manager; B. S. Durkee, chief operator; A. Ellis, night chief operator, and F. J. Shubert, late night chief operator.

At Seattle, Wash., R. W. Banks is chief operator; R. W. Pentzer, night chief operator, and J. Best, late night chief operator.

ROY ENSIGN, employed by the Federal Reserve Bank in Salt Lake City, is another Morse fan who cannot carry on without occasional visits to a telegraph office. Chief Operator Bunnell of Salt Lake is always glad to see Roy unlatching the gate, for this signifies that a good sized sheaf of messages will soon be transferred from the hook to the spindle.

WILLIAM HEARN, late superintendent of the first district, Pacific Division, is now identified with the Dundas-Martin Company, San Francisco.

A. O. SINE, late night chief operator of the office at Williams, Ariz., fifty-four years of age, dropped dead on January 12. Mr. Sine was at one time chief operator for the Western Union at Portland, Ore.

P. W. DREW, for many years superintendent of telegraph of the Wisconsin Central Railroad, later the Soo Line, met with an automobile accident recently in Chicago and at the present time is confined to his home.

THE OLD WIRE CHIEF SAYS:. "When you reach that stage where you can 'put two and two together' without making a noise, you are entitled to move up toward the head of the class."

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STRANGE how a pair of tires enter into the workings of a busy day.

Messengers using HEAVY SERVICE TRACTION TREAD have a decided advantage over the rest of the force—for in the sum total of service rendered may be found the true advantage of good tire equipment.

Time savers—less repairs—more anti-skid protection—it is difficult to find anywhere a better tire than HEAVY SERVICE TRACTION TREAD.

United States Cycle Tires are Good Tires

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RADIO TELEGRAPHY.

Radio Corporation Notes.

E. J. NALLY, president, and David Sarnoff, commercial manager, have returned from a business trip to Washington.

JOHN B. ROSTRON, who recently joined the transoceanic staff of the Radio Corporation of America, after serving with the Commercial Cable Company for twenty-two years, was presented by his associates, when leaving the latter service, with a valuable gold watch, suitably inscribed, as a reminder of their long association.

THE RADIO CORPORATION OF AMERICA has enlarged its executive office space by adding a suite of offices extending across the Broadway front of the Woolworth Building adjoining its present space. The company has also leased extensive quarters for several of its departments at Broadway and Worth Street, which will be fitted up for housing the Marconi Institute, the Wireless Press, the Marine and Repair Departments, the stock-room, etc. The new quarters will be ready for occupancy in April.

LEE LEMON has returned from an inspection trip to Tuckerton.

E. F. BUCHER has moved his office from the Edison Building to the Woolworth Building.

LESTER R. DAMON, during the war in charge of radio installation work on vessels of the emergency fleet, is now engaged in research work in the Philadelphia Navy Yard.

JOHAN B. HELDERS, Dutch radio engineer, and during the war in charge of the 20 K. W. station at Cadiz, Spain, is on his way to Colombia, South America, to install radio equipment.

ROY H. HART, during the war in airplane radio work in France, has returned to the radio research laboratory of the Western Electric Company, New York.

HERBERT F. JEFFERSON, has been appointed assistant chief engineer of the Kilbourne and Clark Company, Seattle, Wash.

THE RADIO CLUB OF AMERICA held a meeting in the Engineering Building, Columbia University, New York, on the evening of February 20, when a paper was presented by Walter S. Lemmon on the subject "The Development of Radio Telephones." The speaker described radio telephone developments during the war period, including an account of the talking arrangements provided between ship and shore for the U. S. S. *George Washington*, the Presidents ship.

Radio Telegraph Stations Returned to Their Owners.

Radio telegraph stations and facilities taken over by the government under wartime powers of the President were returned to the owners of the properties at midnight on February 29, on authority of an order issued by the President on February 17. The order as made public by the Navy Department reads:

"All radio stations taken over by the Government of the United States and now held by it under authority of executive orders of April 6 and April 30, 1917, respectively, including all systems, lines and property taken possession of or received, operated, supervised, or controlled under authority of said executive orders shall, at midnight on the 29th day of February instant, be returned and delivered to the respective owners thereof.

"All restrictions placed under authority of said executive orders of April 6 and April 30, 1917, on all radio stations not necessary to the government for naval communications shall be removed, to take effect at midnight on the 29th day of February instant, from which time the control and operation of all radio stations not owned, controlled or operated by the government independently of action taken by or on behalf of the government under the aforesaid executive orders of April 6 and April 30, 1917, shall be subject to the provisions of the act to regulate radio communication approved August 13, 1912.

"The enforcement of this order is hereby delegated to the Secretary of the Navy, who is authorized and directed to take appropriate action in the premises."

New Wireless Service for Brazil.

The Companhia Radio-Telegraphica Brasileira has been organized by the shareholders of the Marconi Wireless Telegraph Company for the purpose of exploiting radio telegraphy and radio telephones under the patents of the Macroni Wireless Telegraph Company. Schools for the teaching of radio telegraphy will also be conducted throughout the country.

Federal Telegraph Company Pays Dividends.

The Federal Telegraph Company, operating on the Pacific coast, has applied for authority to declare a stock dividend to the Poulsen Wireless Corporation, its sole stockholder. The application was made to the State Railroad Commission of California on February 11. The dividend is to be paid in stock to the extent of the present capital, amounting to $2,391,775. The capital stock of the Federal Company was recently increased from $100,000 to $2,000,000. It is stated that the plan is to dissolve the Poulsen Company.

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BUENOS AIRES, ARGENTINA, according to press reports, has been selected as the meeting place in 1920 of the Pan American Postal and Telegraph Congress.

DIRECT WIRELESS COMMUNICATION has been established between the Mexican stations of Payo Obispo and Mazatlan, and Santiago, Chile.

IN NICARAGUA, the government has established radio telegraph stations at Bluefields and San Francisco del Carnicero for the benefit of students who wish to become proficient as radio operators.

New Radio Audible Alarm.

A new radio telegraph alarm signal system, for the present mainly intended for maritime use, has been placed in service by the Marconi Company and was recently demonstrated at Chelmsford, England. The device enables a ship in distress to automatically ring alarm bells on board any vessels within range, and will do away with the necessity for an operator to be always on duty. The apparatus consists of an automatic transmitter, which will send out a special signal with accuracy, and a reliable receiver which will respond to this signal, and this signal only. It will ensure general and immediate attention being given to emergency calls, such as "S.O.S." and "T.T.T.," the ice warning. The device was used, it is stated, during the war for exploding mines, and its action was illustrated at the Marconi Works on January 15, gunpowder being fired by wireless from a station thirty miles away.

Books on Wireless.

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, is headquarters for all books on wireless telegraphy. Those desiring such books should send for our price list. We make it our business to fill all orders the same day they are received.

The Western Union Multiplex.

The Western Union multiplex system is completely described in a neat pamphlet published by TELEGRAPH AND TELEPHONE AGE. The description of the system has been revised and brought up to date and the work is fully illustrated with views of the different pieces of apparatus. It was gotten up primarily as an appendix to Jones' Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students, but some copies have been bound separately for the use of those who wish to carry it apart from the parent book as a matter of convenience. The booklet is the same size as the Jones' book, and can therefore be easily carried in a coat pocket. It will be found very serviceable to those who are studying the multiplex. The price of the pamphlet is 35 cents per copy. Send orders to TELEGRAPH AND TELEPHONE AGE, J. B. Taltavall, publisher, 253 Broadway, New York.

THE TELEPHONE.

C. P. COOPER has been appointed general superintendent of plant of the Chesapeake and Potomac Telephone Company. During the past year and a half Mr. Cooper has been on special assignment at Washington, D. C., and prior to that was division plant superintendent, New York Telephone Company.

E. H. GREENLEAF has been appointed division plant superintendent, Hudson Division, New York Telephone Company.

SERGIUS P. GRACE, assistant to the chief engineer, eastern group of Bell Telephone companies, and vice-president of the New York Telephone Company, has resigned from the service to become assistant to the president of the Standard Chemical Company of Pittsburg, Pa.

A New Book.

Books which constitute a complete course in elementary electricity and cover in an understandable way all that the student needs to know in order to be qualified for engineering work, are not numerous. Most of the books now available which attempt to answer these requirements are in many respects out of date.

"Elementary Electricity and Magnetism," by Jackson and Black, is a book just off the press, and the authors have filled its 590 pages with theoretical and practical information of a thoroughly up-to-date character.

The book contains twenty-eight chapters with the following headings:

Batteries for Producing Electrical Currents, Electric Circuits and the Flow of Electricity. Ohm's Law, Electric Power and Heating Effects of Electric Currents, Electromagnetism, Nature and Properties of Magnetism, Electromagnetic Induction, Electrical Measuring Instruments, Electrical Measurements, Principles and Construction of Direct-Current Generators, Direct-Current Motors, Electrochemistry, Storage Battery, Principles of Alternating Currents, Inductance and Capacity in Alternating-Current Circuits, Alternating-Current Generators, Transformers, Alternating-Current, Motors, Power Stations and the Distribubtion of Power, Electric Lighting, Electric Heating, Electric Traction, The Telephone, Electromagnetic Waves. Radiotelegraphy and Radiotelephony, Roentgen Rays and Other Rays, Modern Theories About Electricity.

A copy of this book should be in the library of every telegraph, telephone and radio student. The price is $2.50 per copy. From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

J. C. RANKINE, superintendent of telegraph, Great Northern Railroad, St. Paul, Minn., has recently established a satisfactory long distance telephone circuit between St. Paul, Minn., and Havre, Mont., over the railroad lines.

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United States Military Telegraph Corps' Fifty-Ninth Annual Reunion.

The annual report of this society for 1919 has recently been distributed. The society button is embossed in colors on the front cover of the booklet, making a striking appearance.

The report is full of very interesting matter to all telegraphers, especially "Old Timers."

During the year 1919 there were fifteen deaths of veteran members of the Civil War Corps, including two notable characters—Andrew Carnegie, the founder, and Col. William Bender Wilson, second president of the society, serving for twenty-seven years, succeeding comrade William R. Plum, now of Lombard, Ill., historian, who served seventeen years from the organization of the society in 1882.

The report contains memorial resolutions concerning the deaths of both Mr. Carnegie and Colonel Wilson.

Major Charles Patterson Bruch, son of Capt. Sam Bruch, veteran (who died in March, 1885), was elected president for the ensuing year, and the three vice-presidents were re-elected, namely, William L. Ives, Richard O'Brien, veterans; and Arthur Lincoln Tinker, son of Charles A. Tinker, veteran, deceased.

David Homer Bates was re-elected secretary and treasurer, an office he has filled since 1908, succeeding the late James E. Pettit, veteran.

The report contains the latest information relating to the forty-year-long appeal of the survivors of the Civil War Corps for pensionable status, the same as enlisted men. Since the annual meeting was held in Cleveland, Ohio, last September, Secretary Bates has appeared before the House Committee on Military Affairs and made an oral statement in support of House Bill 5815, which, if it becomes a law, will provide a soldier's pension for about 100 veterans and 40 widows.

Mr. Bates in his statement called the attention of the Committee to the fact that the act of Congress approved by President Cleveland, January 26, 1897, constituted the members of this Corps as a part of the United States Army, and also to the collateral fact that thirty of the survivors were enlisted men, having been drafted from their regiments into the military telegraphers' corps, and were therefore already eligible to receive a soldier's pension, while the remaining survivors are, by the act of 1897, barred from pensions. He says this is unfair to the latter class. Mr. Bates urges all the members of the society to write to their representatives, and especially to the members of the House Military Committee, to favor the bill. He adds that, unless prompt action is taken, there will be very few left to avail of its benefits.

IN the year 1887, there were forty miles of electric railroad in the United States, and twenty miles in Europe.

OBITUARY.

Death of Z. A. Lash.

Z. A. Lash, president of the Great North Western Telegraph Company, died in Toronto, Ont., on January 24. At the time of his death Mr. Lash was seventy-four years of age.

AUGUSTUS B. CARROLL, assistant chief operator in the main office of the Postal Telegraph-Cable Company, Chicago, Ill., died of pneumonia on January 21. Mr. Carroll had been in the service of the company thirty-three years, and was known in all parts of the country as an expert telegrapher and wire chief.

WILLIAM HOLMES, seventy-six years of age, for many years superintendent of the tariff bureau, Western Union Telegraph Company, New York, died on February 13.

GEORGE MCGANN, aged sixty years, formerly superintendent of the American District Telegraph Company, St. Louis, Mo., died recently in that city. Mr. McGann served as operator and as chief operator in the service of the Mutual Union Telegraph Company, Postal Telegraph-Cable Company, and Western Union Telegraph Company. He is survived by his wife.

JAMES J. MCSWEENEY, age 50 years, employed with the New York Stock Exchange, died of cancer on January 25.

H. H. HUBBARD, age 87 years, an old time telegrapher, died at Oak Park, Illinois, on January 24.

MISS VERNA G. KEEFE, formerly manager for the Western Union Telegraph Company at Montour Falls, N. Y., and Oneida, N. Y., and recently in service in the Syracuse office of the company, died in the latter city on February 10.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

BY ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Telegraph and Telephone Age

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International Communications Conference.

Following out the provisions of House Bill No. 9822, passed in Washington on December 8, 1919, authorizing the President to arrange for and participate in an international communications conference, President Wilson has appointed as the United States representatives Albert S. Burleson, Postmaster General; Rear Admiral W. S. Benson, and Walter S. Rogers of Illinois.

As we pointed out in an editorial in our February issue, there is a pressing need for new laws and new regulations covering systems and methods of international communication. Unless, however, the appointments mentioned above are honorary, and it is the intention to appoint additional, active members to represent American interests, we are apparently destined once more to witness what has taken place at previous communication conferences.

The cable treaties of 1884, 1885 and 1886 are obsolete; and so far as radio communication is concerned, the provisions promulgated at the London Conference, as well as our radio law of 1912 are obsolete.

A very significant change which has taken place in international communication during the past year or two, and which will expand rapidly in the immediate future, is that of the establishment of high-power long range radio stations by practically every large and small nation in the world.

So long as international communication was carried on by means of submarine cables only, practical considerations imposed the requirement that a relatively small number of landing stations be used. This meant that to a large extent the international telegraph traffic of any given nation must pass over lines and through stations of foreign countries intervening between the country of origin and the country of destination.

The possibilities of radio have changed this situation, and countries which have not been in a position to arrange for direct cable communication or which are not in the fortunate position of having short route seaports are at the present moment engaged in erecting long distance radio stations for the purpose of affording direct communication with other countries.

Again, so far as radio is concerned, it should be realized that international regulation is a subject having much to do with national regulation. Radio operation differs from cable or wire working in that there may be at times various degrees of "spilling over." During the war stations in France complained that the spark station operated by the Navy Department near Washington at times caused "international" difficulties in France.

Each of the three gentlemen named by the President to represent the United States at the forthcoming conference has excellent personal qualities, and each of them has done a considerable amount of work in the public interest; but in view of the fact that there are many other men at hand who have given the subject of electric communication lifelong study and who on this account are much better qualified to represent American interests we express the hope that the commission is to be enlarged to include members so qualified, or that the members already appointed may be authorized to retain advisers who comprehend the task.

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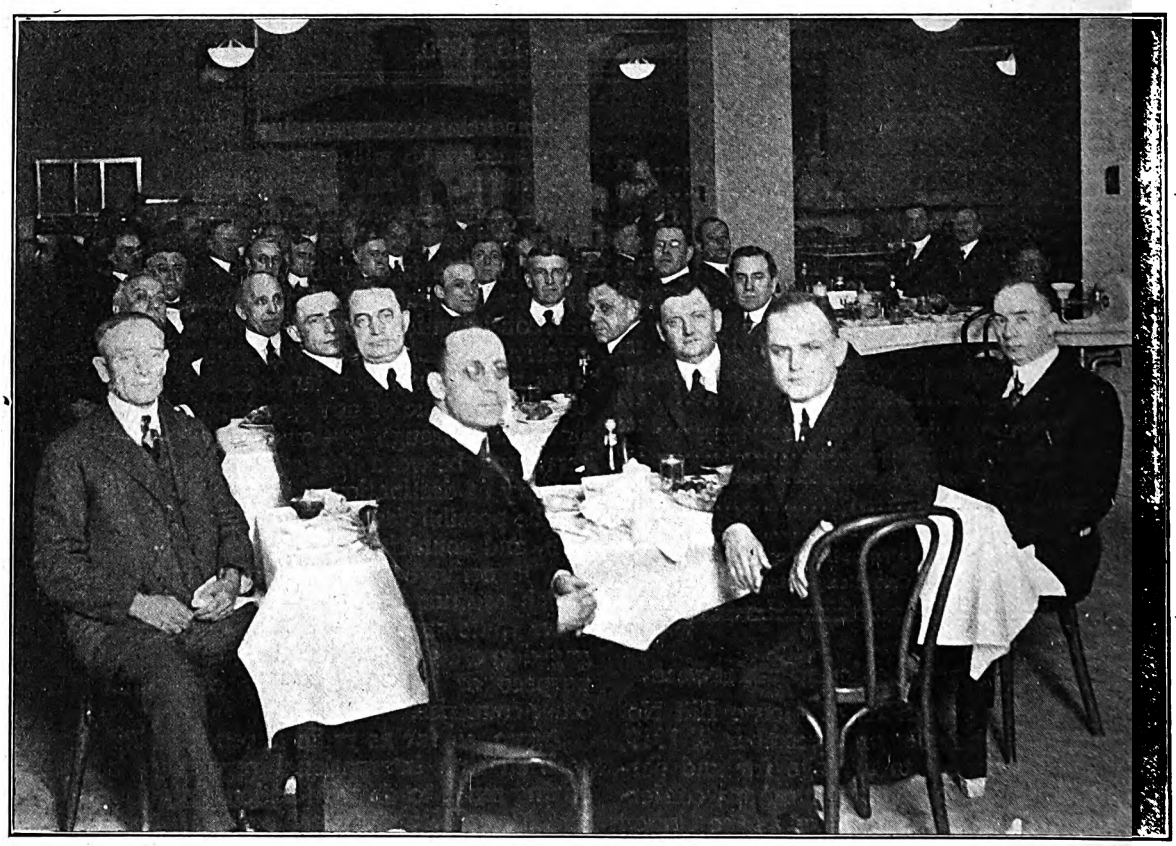
IMPORTANT GATHERING OF TELEGRAPH MEN

The Western Union Goodfellowship Club, of Chicago, celebrated the first anniversary of the organization of the Club, on the evening of February 9.

On this occasion the Club gave a dinner to the various superintendents of telegraph of railroads with headquarters in Chicago. The main address of the evening was given by William Bennett, Chicago. One feature, wherein the musicians impersonated a strolling band of Italian musicians, was enthusiastically received.

The photographic reproduction herewith shown is of a section of the dining room, while the dinner was being served. The speakers' table is in the foreground. Mr. Bennett is seated on the extreme left of the picture, and on the right of A. C. Cronk-



BANQUET OF COMMERCIAL AND RAILROAD TELEGRAPH OFFICIALS, CHICAGO.

superintendent of telegraph, Chicago and North Western Railroad. Mr. Bennett spoke on "Industrial Unrest," and his review of the prevailing conditions showed that he has made a thorough study of the subject from all angles.

The dinner was served in the new Western Union restaurant at No. 427 South La Salle Street. The entertainment included musical selections furnished by the Western Union orchestra, and special acts participated in by Mrs. Beckett and Miss Daggett of the traffic department, and Miss Paulson and Mr. Fitzmartin of the commercial department,

hite, general manager, Lake Division, Western Union Telegraph Company. Others at the head table, and at adjoining tables, whose likenesses may be recognized are: A. C. Johnson, president of the Club; H. F. Kline, secretary-treasurer George D. Hood, C. A. Worst, C. McCormick A. C. Adams, R. F. Finley, F. H. Van Etten and W. L. Connolly, superintendents of telegraph of railroads entering Chicago; J. J. Welch, division superintendent of traffic Western Union, Chicago E. T. Jones, chief operator, Chicago, and Messrs Webber, Wilhoite and Goggin, of the Western Union main office, Chicago.

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ADJUSTMENT OF SEMI-AUTOMATIC MORSE TRANSMITTERS

By J. Rosenbaum,
Manager, New York Telegraph Department, Union Pacific Railroad.

[Editor's Note.—Mr. P. F. Frenzer, superintendent of telegraph of the Union Pacific Railroad System, Omaha, Neb., chairman of Special Committee C, Committee No. 6, Telegraph and Telephone Division, American Railroad Association, which has in hand the compilation of standard rules governing the use of semi-automatic Morse transmitters, received from Mr. Rosenbaum a contribution on the subject which is herewith reproduced.]

To my mind it is questionable whether a strictly standard method of adjustment is practicable with respect to the semi-automatic telegraph transmitter, any more than can transmitting on the Morse key be standardized. Proper transmission on telegraph circuits has been, and I feel always will be, governed by the intelligence and judgment of the telegrapher. The closest we shall ever get to standardizing transmission will be to guide and develop that intelligence and judgment, through standard rules, which experience has dictated to those of us who from the very inception have successfully used semi-automatic transmitters. And one of the best of these rules to gauge a telegrapher's ability with a semi-automatic transmitter is to have him change from very rapid to extremely slow transmission at two minute intervals, in a test of say ten minutes. If he can form his characters perfectly in such a test he shows that he possesses the essential qualifications necessary to proper transmission over wires of varying classifications and lengths, and on the result of this test he shall be charged with a demerit for every character he forms incorrectly, and I venture to predict that there would be a decidedly noticeable and general improvement in transmission and a diminution of friction and dissension.

In my experience I have found that the users of semi-automatic transmitters who can form their characters correctly, and can quickly vary their transmitting speed from fast to slow, or intermediate, as the occasion may require, encounter very little trouble getting their transmission through on all classes of circuits. But the telegrapher who is permitted arbitrarily to adjust the "bug" to his own rate of high speed irrespective of his ability or class or length of circuit, the telegrapher who cannot form characters properly, such as letters "P" and "V", or figures "3" and "6", or differentiate between them in receiving, and frantically attempts to go from one character to another without properly forming some of them—he it is who is the cause of "breaks" and dissensions, that some of us are mistakenly attributing to other causes.

I have used advisedly the words "frantically attempts". I have watched men incapable of properly forming their Morse characters, and unable to transmit at anything except the highest speed adjustment of the "bug", swing into the second character of a word before forming, in a clear cut manner, the first one, and, of course, the inevitable "break" would come: "You are sticking", etc. Then would follow an attempt by the transmitting operator to adjust his "dot" contact points. He again starts and primarily because of faulty transmission, and also because he has made his "dot" contact adjustments too light; and not because of the resistance in the cord running to the key slot from the "bug", or for no other reason, except that he does not make his characters clean cut, does not Morse fail to reach the receiving operator.

Let me add here that my experience has been that with the proper formation of the characters, there comes automatically and unconsciously—if the thumb and fingers are held the least bit rigid—the clear cut transmission absolutely essential to carry the characters through to their destination, whether locally, intermediate or distant, if one ball of standard size is moved forward one-quarter of an inch from the "dot" contact point on the vibrating bar for approximately each thousand miles of circuit or fraction thereof.

It would be amusing, if it were not tragic, to see so great a number of the present day telegraphers who cannot differentiate between the characters in "H" and "P"; "P" and "6"; "V" and "4", etc., unless formed incorrectly; and I fear that if this sort of thing is permitted to grow on the coming generations of telegraphers the multilation will continue to the point where Morse will, in the not very distant future, be unrecognizable, and a lost art, and a telegrapher to qualify will have to be a clairvoyant rather than a man of telegraphic capabilities. When the future broker operator transmits a letter "P" or figure "6", in an order to be executed at the market price, that price will have fluctuated several times before he finishes either of these characters. Other branches of the telegraph will suffer in a like manner.

Summarizing the above, I feel that semi-automatic transmission cannot be standardized, but the remedy for improvement lies in the vigorous application of a fundamental rule—that the applicants for positions must be able to transmit Morse, Morse clean cut and firm.

Our Morse key senders of poor calibre were troublesome, are troublesome, and would be just as much a pest, and the apparent enigma to the wires that the "bug" transmitter appears to be, if he could increase his speed to that of the "bug" user.

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INTERPLANETARY WIRELESS

PROBABLE ORIGIN OF MYSTERIOUS RADIO SIGNALS

By A. G. Williams, Sr.

The solar system is a vast installation of dynamic bodies under intense electrical excitation; the sun, the central station of our solar system, all the planets substations under the central control. Each body, however, is automatically and independently rotated upon its axis by the all pervading ether of space, which is an adamantine expanse of static electricity, or magnetic field, and, therefore are magnetized by the surrounding magnetic or electrical ether, rotating as vertiable electro-dynamic engines and are governed by the law of electro-magnetic rotation.

The central sun by its enormous size dominates its attendant planets, and every storm—or as we call them—sunspots, are tremendous tornadoes or cyclones in the solar atmosphere. The sun, an incandescent globe, is fired by friction against space. The planets are semi-extinct suns with an interior heat, and will evidence heat until their rotation ceases.

Sunspots cause electrical disturbances which are evident on all systems of telegraphy. The magnetic needle responds to its fluctuations. Vivid aurorae are coincident; in fact, they are the wireless signals emanating from the sun. The flickering auroral displays are the "S O S" from the sun. The planets in turn respond and react upon the sun. Comets and meteoric showers as they sweep round the sun cause violent disturbances, but these waves or apparent signals are electromagnetic fluctuations in the interstellar medium and cannot be interpreted as intelligible signals. They are purely mechanical or dynamic signals. As well try and interpret thermometric or barometric changes, which are really another display of the dynamic changes going on constantly in the universe—affecting our atmosphere.

Electricity is the universal energy of the infinite universe by which all matter is set in motion. The earth is a type of the universal material universe. It is a magnetic body; rotates upon its axis and its interior is still incandescent with a cool crust enclosing its molten interior, surrounded by an atmosphere of gases maintained in a gaseous condition by the earth's heat. The aqueous ocean is another body of liquid gases also maintained as such by the earth's heat.

The aurora borealis and australis are the charge and discharge of electromotive forces from space. We can scarcely appreciate the force of a single flash of lightning, yet our earth receives a constant stream of lightning covering hundreds of thousands of square miles of surface in the polar regions; sufficient energy to turn it rapidly on its axis.

Man is learning to use this electrical energy which can be gathered from the atmosphere and concentrated as a means of heat, light and energy. Energy in any form is a transformation of the universal celestial electrics.

A veritable trinity—electricity, the primary; heat, the secondary; light, the teritiary—and resolves into its primal state, without loss—one hundred per cent. efficient, therefore never lost, infinite, omnipotent and omnipresent.

Thus theorizing, any observable signals are simply guess work; but they have a meaning which can be interpreted. I have observed a sequence of electrical disturbances on the Atlantic cables, which recurred in about twenty-four days, showing that the same sunspot reappeared coincident with the sun's revolution. These disturbances last three days—another sunspot comes into range, another disturbance takes place.

During the last four or five years these magnetic storms have been a constant source of trouble especially in submarine and wireless telegraphy, false signals mutilating words, and rendering code words especially unintelligible, causing complaints of errors in transmission, which are unavoidable and possibly beyond human ingenuity to overcome.

If such is the case, how can we imagine any planet trying to communicate with the earth, when our own systems of communication are so much interfered with and messages rendered meaningless?

Who is capable of forming a universal celestial code or language?

Scientists claim there is not an absolutely quiet spot on our earth. Fluctuations are evident in any body of matter in motion. The earth spins round 24,000 miles each day—swings around the sun in a year with a speed of seven miles per second. In addition, it performs a cycle with the sun around some other larger sun in about 320 years, and so on ad infinitum—a vast cyclical range is performed by the universe in an illimitable space.

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THE CENTENNIAL OF THE ELECTROMAGNET

DISCOVERY OF ELECTROMAGNETISM MADE ONE HUNDRED YEARS AGO

It is probable that sometime during the coming Summer or Fall months appropriate ceremonies will be held to mark the one-hundredth anniversary of the discovery of electromagnetism. The electrical societies throughout the country, both national and local, already are at work on programmes which it is hoped may be carried out in one or more of the large cities.

In telegraphy, telephony, submarine cable signaling and in radio signaling, electromagnetism stands as the fundamental discovery which from the beginning until the present time has been the scientific basis of these arts. Without a knowledge of electromagnetism electric communication as we know it today would not exist.

From the time of Gilbert, in England, in the year 1600, the subject of electricity had received the attention of the leading scientific men of Europe, and during the intervening 220 years—until 1826— history records the names of many savants who took little or big steps forward in developing the forces of electricity to stages where such powers could be employed usefully in the work of man. These names include Von Guericke, of Germany, who in 1655 observed the transference of electricity through a conductor; Boyle, in England, who in 1675 amplified Gilbert's work; Hauksbee, in England, who in 1705 observed the resemblance between the electric spark and lightning; and, in the following century were performed the well known experiments of Stephen Gray, Dufay, Von Kleist, Benjamin Franklin, Volta, Le Sage, Coulomb, Galvani, and Humphrey Davy.

The study of electricity was given a new impetus with the discoveries of Oersted, of Denmark, and of Ampere, of France, in the year 1820; in fact, that year marked the beginning of the science of electricity and magnetism as we have known it during the past century, and it is to celebrate the achievements of these men and their contemporaries that the electrical societies in 1920 propose holding a centennial gathering of some sort this year.

The average student of the history of electricity is familiar with the names of the early discoverers and with what each man discovered; but in the matter of dates only a few diligent diggers with good memories are able to connect particular events with the period of their happening.

In this connection it is interesting briefly to review scientific personnel as it existed in the year 1820. In that year, in France, Coulomb had been dead twelve years; Ampere was forty-five years of age; Arago was thirty-four, and Le De Rive was nineteen years of age. In England, Daniell was thirty years of age; Faraday was twenty-nine; Sturgeon was twenty-seven; Humphrey Davy was thirty-two, and Clerk Maxwell was not yet born. In Germany, Steinheil was nineteen; Schilling was forty-five; Humboldt was fifty-one; Ohm was thirty-one; Ruhmkorff was seventeen; Werner Von Siemens was but four years of age and Helmholtz was not yet born. In Denmark, Oersted was forty-three years of age, and in Italy Volta was seventy-five.

In the foregoing we have figures which should aid one in picturing how each of these early scientists who were at a productive age in the year 1820 would have appeared physically with respect to his contemporaries had all been present at a meeting at one time.

Also, in reviewing the names and the ages of these men—all famous as investigators—we can form ideas as to the competition which Oersted and Ampere had in breaking through the walls of mystery which then surrounded the new science of electricity.

In early electrical work, as in other branches of science, the achievements of the early investigators too often have been looked upon as accidental discoveries. This is a result of loosely written biography and of occasional attempts on the part of "popular" writers to magnify to an absurd degree the work done before breakfast each day by some genius of the past. Each important step forward in scientific advance must perhaps have a natal day—the discoverer is entitled to his milestones. But, discoverers and inventors generally know that a discovery in science in most cases is in reality a culmination: the end of a journey; the completion of a task.

The identity between electricity and magnetism had long been suspected, and in the year 1774, the following question was proposed by the Electoral Academy of Bavaria as the subject of a prize dissertation: "Is there a real and physical analogy between electric and magnetic forces; and, if such analogy exist, in what manner do these forces act upon the animal body." The essays received and published by the Academy on that occasion were collected and published* ten years later by Prof. Van Swinden, the author of one of the essays. The conclusion he arrived at after long and elaborate discussion of the subject was that "the similarity between electricity and magnetism amounts merely to an apparent resemblance and does not constitute

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* Recueil de Memoires Sur l'Anologie de l'Electricite et due Magnetisme Couronnies et pub lies.—A. La Haye, 1784.

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a true physical analogy; whence, these two powers are essentially different and distinct from one another." Opposite views were, however, held by others of the essayists, and there followed many experiments which, looking back upon them from the date of Oersted's announcement in 1820, appear on several occasions to have been upon the threshold of success. The names of some of those who were on the trail of the elusive fact of "identity" appear in the published scientific papers of the day.

In Roget's "Treatises on Electricity, Galvanism, Magnetism, and Electro-magnetism," published in the year 1832, it is shown that Professors Steilglehner and Hubner, Scoresby, D'Alibard, Wilke, Beccaria, and Ritter all were at times close to the truth, and that each of these men performed experiments which must have in some sense been contributory to the final achievement.

In scientific search as in all other searches that attract the efforts of the venturesome the Goddess of Fame holds in one hand behind her back the prize while with the other she holds off competitors and aspirants until he arrives who alone holds the secret. And, so, to Hans Christian Oersted, the Dane, forty-three years of age, as long as the world lasts, will electrical students accord the glory of having discovered the relation between electricity and magnetism.

Oersted was professor of natural philosophy and secretary to the Royal Society of Copenhagen. In a work which he published in the year 1813, on the identity of chemical and electrical forces, he had thrown out conjectures concerning the relations existing between "the electric, galvanic, and magnetic fluids." The first account of Oersted's discovery which appeared in English is contained in a paper which he communicated to Thomson's "Annals of Philosophy," for October, 1820. In this paper Oersted recounted all of the now well known effects of passing a current of electricity through a metallic conductor above or below a pivoted magnetic needle.

NORTH POLE AND SOUTH POLE.

The relation between direction of current flow and magnetic effect in a conducting wire caused no end of speculation among the philosophers of a hundred years ago. Modern students who have mastered the fingers and thumb method of depicting direction of current flow and resulting magnetic field will be interested in the first attempt to create an aid to memory in retaining this essential information. In Biot's *Precis Elementaire de Physique*, printed in Paris in 1824, it is pointed out that "If an observer be supposed to occupy the place of the wire, with his head at the copper, and his feet at the zinc extremity, his face being turned toward the needle, the force which proceeds from the wire will cause the elements of austral magnetism to tend from the right hand of this observer to his left, and the elements of boreal magnetism to tend from his left toward his right, perpendicularly to the shortest distances of these elements from the wire."

Writing of Oersted's discovery, Michael Faraday, the great English physicist, said that "it burst open the gates of a domain in science, dark till then, and filled it with a flood of light."

It fell to the lot of a Frenchman to take up the work of Oersted and carry it forward at a pace which outstripped all others in the onward march of progress. This man was Andre Marie Ampere.

AMPÈRE.

Andre Marie Ampere was born at Lyons, France, in the year 1775, and, therefore, in 1820 was two years Oersted's senior.

It was on the 11th of September, 1820, that Ampere learned of Oersted's Copenhagen experiments, in which a magnetic needle was deflected due to current flowing through a wire in the vicinity of the pivoted needle. On the 18th of September Ampere read a paper before members of the French Academy in which was made the first announcement of the fundamental principles of electro-dynamics—the principles upon which all subsequent electrical instruments and electrical machinery employing electro-magnets have been based. This includes telegraph apparatus, telephone instruments, induction coils, transformers, generators, motors, submarine cable receiving instruments and so on through the entire list of electrical inventions.

During the experiments duplicating Oersted's work Ampere made the capital discovery that magnetic effects could be produced by means of the electric current without the use of a magnetized needle; in fact that a wire carrying current has an inductive relation to other wires in its neighborhood whether they are or are not carrying currents.

On the joint work of Oersted and Ampere it may truthfully be said that the whole structure of modern electrical development was founded.

The Plata Telegraph and Telephone Co.

It is reported that the German South American Telegraph Co. has received an offer to take over the company's share-holding in the Company Telegrafico-Telefonia de la Plata, of Buenos Aires. It appears that the German banking group associated with the former company acquired about 84 per cent. of the capital of the Argentine company in 1911, and thereby obtained control of the company, which has a share capital of 500,000 pesos, and maintains services between Monte Video and Buenos Aires. Between 1907 and 1911 the latter's dividends averaged 13 per cent., and in 1912 a rate of 5 per cent. was paid, but nothing has been distributed from 1913 to 1917 inclusive. As a consequence, the German company has formed a reserve fund against this investment, which amounted to 980,000 marks at the end of 1917.

IF you ever expect to get ahead, now's the time to commence. No one ever did anything "tomorrow." Make up your mind that you are going to own a $100 or a $1,000 registered Treasury Savings Certificate this year, and get it!

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THE STORY OF THE TELEGRAPH

Including

SUBMARINE CABLES AND RADIO TELEGRAPHY

(*Continued from March 1 issue.*)

The success of Morse's first line created wide interest in the telegraph, and the construction of lines in many directions was soon begun. In 1846, a line was opened for service between New York and Boston, another between Philadelphia and Pittsburg, and still another between Buffalo, New York, and Toronto, Canada; in 1847, a line between Troy, New York, and Montreal, Canada; in 1848, a line between Portland, Maine, and Calais, Maine, and many other lines.

In 1849, the House Printing Telegraph Company was organized and constructed lines between New York and Boston, and between New York and Philadelphia. A year later House lines were built

S. F. B. MORSE

between New York and Buffalo and between Buffalo and Cincinnati, the character of pole line construction showing great improvement over that of lines previously constructed. The House system was operated in opposition to the Morse lines.

In the year 1850, still another opposition company known as the Merchants Line entered the field, erecting lines between New York and Boston, and between New York and Washington. The system was based upon the electro-chemical telegraph inventions of Alexander Bain, of Scotland. Bain had applied for an American patent in the year 1849. After about three years of operation the Bain lines consolidated with the Morse lines, the combination taking the name Union Lines.

In the year 1851, there were over fifty separate telegraph companies doing business in the United States; many of them operating under Morse's patents, others using then existing printing telegraph systems.

On April 2, 1851, Henry S. Potter was elected president of the New York and Mississippi Valley Printing Telegraph Company, the immediate predecessor of the Western Union Telegraph Company: of which latter company Mr. Potter was the first president.

It may well be imagined that with fifty or more telegraph companies in the field, many of them operating in exclusive territory, the cost of telegraphing, together with the delay in transferring messages from one company to its connections, created a situation which had to be corrected if the new art was to have a fair opportunity to be efficiently useful.

Although it was not until 1866 that the headquarters of the Western Union Company moved from Rochester, New York, to New York City, a movement was set in motion in 1851 with the object of bringing about consolidation of the various adjoining telegraph lines. Also, in 1851 the application of the telegraph to railroad requirements was begun. In that year the first telegraphic train-order was sent, on the Erie Railroad. Within two years thereafter the Erie Railroad had 497 miles of telegraph line in operation, with fifty-two telegraph stations, and employed sixty-five telegraphers.

The rapid extension of the telegraph which followed to meet railroad and commercial requirements attracted to the work many bright minds, and during the years intervening between 1851 and 1858 many improvements were made in telegraph apparatus. In 1851, the first automatic repeater was invented by C. S. Buckley. In 1852 Moses G. Farmer experimented with double telegraph transmission over a single wire. In 1855, George F. Milliken, of Boston, introduced the first spring-jack switch-board, and in the same year George M. Phelps, and David E. Hughes perfected a new printing telegraph system. In 1857, Farmer and Woodman, introduced an improvement in automatic telegraph repeaters.

In the year 1857, the first attempt was made to lay a submarine telegraph cable between Europe and America, and although the first efforts failed of success, the experience gained proved of inestimable value in a later enterprise.

The first submarine cable laid was that between Dover, England, and Calais, France, in the year 1851. Two years later a six-conductor cable was laid between England and Ireland. In the year

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1856, American and British naval officers made extensive soundings in the Atlantic Ocean between Europe and America for the purpose of charting possible routes for cables to be laid between Europe and North America.

During the year 1856 a cable was laid between Newfoundland and Nova Scotia, a distance of eighty-five miles.

In the month of August, 1857, the first attempt was made to lay a cable across the Atlantic. The venture failed, owing chiefly to the employment of imperfectly designed cable-laying machinery. Three hundred and thirty miles of the cable was lost in the sea.

In the summer of 1858, another attempt was made to forge the link between Europe and America. The expedition met with several mishaps, but on August 5 of that year the completed cable was ready for test between Trinity Bay, Newfoundland, and Valentia, Ireland, a distance of 1,984 miles on the surface of the ocean, the actual length of the cable being 2,267 miles. The extra 283 miles of cable was taken up in following the hills and dales of the sea bottom.

After three weeks of fairly satisfactory operation, chiefly of an experimental nature, this cable failed.

In the year 1865, Cyrus W. Field, of New York, employing the famous British ship *Great Eastern*, made a brave but unsuccessful attempt to establish the much desired telegraphic connection across the Atlantic, when 1,186 miles of cable had been passed overboard, the strand broke, and its recovery was, for the time being, abandoned.

In 1866, Mr. Field reorganized the enterprise under the name of The Anglo-American Telegraph Company, and once more to the *Great Eastern* the task was assigned to complete the job. The route taken in crossing the Atlantic was about twenty-seven miles north of the line along which the 1865 cable was laid. The cable extended between Foilhommerum Bay, Ireland and Hearts Content, Newfoundland. The *Great Eastern* made the trip in fourteen days, sailing 1,909 miles, and laying 2,113 miles of cable. This was the first satisfactory cable laid across the Atlantic, and in cable circles July 27, 1866, is known as the date upon which submarine telegraphy became an accomplished fact.

The second Atlantic cable was made up of the abandoned section of the 1865 cable spliced to a new section. The work was done by the *Great Eastern* in September, 1866.

At the start both of these cables were worked at a speed of six words per minute, but improvements made in terminal apparatus, together with increased skill on the part of the operating staff, shortly resulted in a speed of seventeen words per minute.

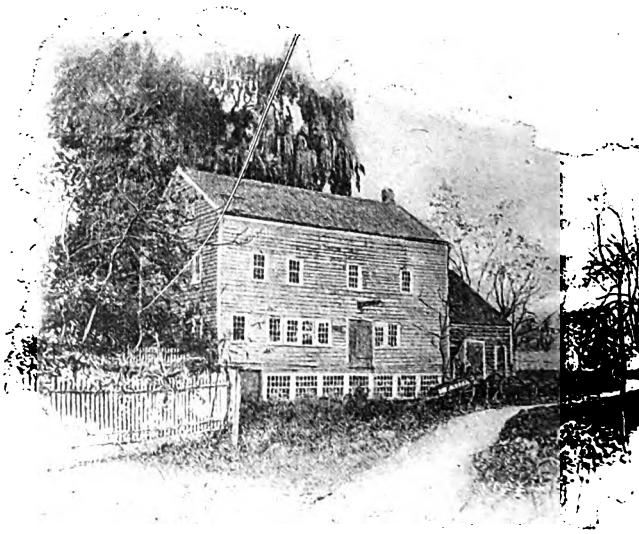
In later years the employment of Lord Kelvin's siphon recorder as a receiving instrument, with other improvements, ran the speed of cable operation up to forty words per minute. Today a speed of forty-five words per minute simultaneously in each direction over a cable is the ordinary gait, while certain cables which are equipped with electrical amplifiers of recent invention are carrying 135 words per minute.

Going back, for a moment, to where we left off in the development of land line telegraph systems, —the year 1858,—the next important period was that of the Civil War in the United States.

On March 15, 1861, overland telegraph communication was for the first time established between cities on the Atlantic coast and California, and many other lines, north, south, east and west were opened to traffic.

The North-Western Telegraph Company erected a line, consisting of a No. 8 iron wire between Milwaukee, Wisconsin, and St. Paul, Minnesota, in the year 1862. At the various points where the wire crossed the Mississippi river, watchmen were stationed to lower the wire into the river in order to prevent steamboats from breaking the strand as they passed up or down the river.

It was in the year 1863, that the original Morse patents expired. A year later several of the existing independent telegraph concerns combined under the name of the United States Telegraph Company.



VAIL'S SHOP AT SPEEDWELL.

In 1865, two new telegraph companies entered the field; namely, the Franklin Telegraph Company, and the Atlantic and Pacific Telegraph Company.

In the year 1866, the United States Telegraph Company, together with other independent lines, consolidated with the Western Union Company, and in that year the general offices of the Western Union were transferred from Rochester to New York City.

During the period of the Civil War the telegraph was used for the first time in this country in military operations. For the first time in history the value of the telegraph to armies in the field was demonstrated during this conflict. Comparing Sherman's operations in 1864, with Napoleon's plans of 1812 to invade Russia, the great benefits of a ready means of instantaneous communication be-

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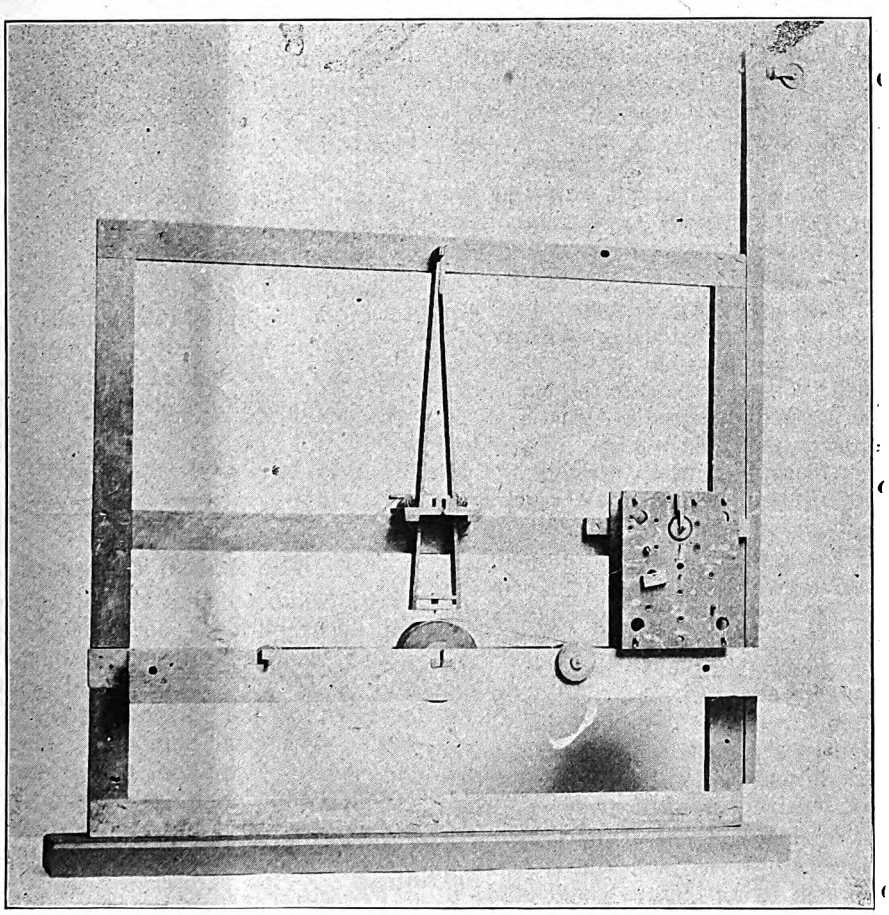
tween points remotely separated, it is to the point to observe that owing to antiquated methods of communication it required nearly six months for Napoleon to concentrate a force of 500,000 men to enter Russia via Poland. Lack of an adequate means of communication in advance and to the rear was a handicap which spelled ultimate disaster for the French armies.

After 84 days' march and a costly battle, Napoleon entered Moscow only to find that the country had been laid waste and the city of Moscow burned down. In the face of an approaching severe winter Napoleon retreated, and chiefly owing to lack of



MORSE'S FIRST RECEIVING INSTRUMENT.

communications lost 450,000 men before reaching a base of supplies.

In the year 1864, with thoroughly organized telegraphic communications, General Sherman began his march into Georgia with 100,000 men; within three months he entered Atlanta. Reaching that point Sherman was able to communicate with the commanding general 1,500 miles away, and to plan his march to the sea, where instead of finding desolation he found available plentiful stores and supplies provided for his coming,—all through the medium of the telegraph.

During the period of the Civil War the financial resources of the country had been so taken up with the prosecution of military undertakings that only a limited amount of new line was constructed. Also, some of the existing trunk lines had not been maintained with a view to future increase in traffic, and as it developed that during the period of reconstruction the telegraph was used extensively for social and commercial correspondence a situation was presented wherein additional wires would have to be strung over all main routes, or that American genius would forthwith have to invent systems making possible the transmission of more than one message over an individual wire simultaneously.

And, as always, American genius met the issue fairly, and in a satisfactory degree.

Once more harking back a few years we find that in 1852, Moses G. Farmer, that earnest pioneer philosopher, had conducted experiments with a view to setting up apparatus capable of doubling the capacity of a single wire. Although Farmer did not attain complete success he went far enough to start others working along the same lines.

Experiments with a similar end in view were conducted by Gintl, in Austria, and by Siemens and Halske, in Germany in the year 1853; also by Stark, in Austria, and Bernstein, in Germany in 1855.

It was not, however, until the year 1868, that a practical method of duplex telegraphy was invented. In that year Mr. Joseph B. Stearns, of

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Boston, brought out a workable system, which was first placed in service on the lines of the Franklin Telegraph Company between New York and Boston, and a year or two later on the lines of the Western Union Company.

The practical application of this invention at once doubled the capacity of all single wires so operated.

It has been stated that "coming events cast their shadows before", and as a momentous event closely related to the needs of the telegraph in the year 1869 it is apropos here to record that it was in that year that Thomas A. Edison,—then a youth of twenty-two years—arrived in New York City.

In 1872, Mr. Edison invented a chemical automatic high-speed system which made possible the transmission of a greatly increased number of words over a wire in a given time, and a year later, Edison and Prescott successfully operated a quadruplex system of telegraphy over a circuit from New York to Boston. This system provided for the simultaneous transmission of two messages in each direction over a single wire. American genius had not been found wanting.

The duplex and quadruplex systems have not only been of great value in increasing the capacity of lines for Morse operation, but have been successfully applied in further increasing the line capacity in connection with high speed automatic telegraphy. The duplex principle forms a part of modern printing telegraph systems, providing that lines operated as printer circuits may carry one message in each direction at a time simultaneously.

In the year, 1876, the first underground pneumatic tubes were laid between the main office of the Western Union Company, in New York, and the telegraph office in the Wall Street district, and in 1877 two underground cables 2,200 feet long, with 30 conductors each were laid in New York City for telegraph purposes. In 1879, Stephen D. Field, first employed dynamos for the generation of electricity for telegraph purposes, in place of gravity cells, then very extensively used.

Although the telephone arrived in the year 1876, it was not until twenty years later that telephone service had developed to an extent which made it a competitor of the telegraph to be reckoned with. The rapid increase of telegraph traffic during these years resulted in the telegraph being regarded as a fertile field for investment. Once more there was an epedemic of new telegraph companies, almost as widespread as that prevailing in the early fifties.

In 1879, an opposition company entered the field under the name of The Baltimore and Ohio Telegraph Company. In 1884, David Homer Bates, at that time assistant general manager of the Western Union Company, became President of the B. & O. Company. In 1887, this company had a total of 50,978 miles of wire in operation, extending from Maine to Texas by way of New York, Washington, Chicago, and St. Louis. In October, 1887, the B. & O. Company consolidated with the Western Union Company.

In 1879, The American Rapid Telegraph Company was organized with a capital of three million dollars. In 1883, the company had in operation about 15,000 miles of wire; on the trunk lines using the newly invented Foote and Randall high-speed chemical automatic system. The automatic system of operation was early abandoned in favor of Morse instruments, and in the year 1884, the American Rapid Company was absorbed by the Western Union.

In 1883, The Mutual Union Telegraph Company was organized with the very modest capital of six hundred thousand dollars. A year later the company's plant was leased to the Western Union for a term of ninety-nine years.

Still another telegraph company was launched in the year 1881, known as the Bankers and Merchants Line, with a capital of one million dollars. In September, 1884, this company was declared bankrupt, and in 1885 the property was taken over by The United Lines Telegraph Company, a newly organized concern. The United Lines Company, in turn, within a short time was taken over by the Postal Telegraph-Cable Company (first organized in the year 1881, and re-organized in 1883) which company has remained in the field up to the present time in opposition to the Western Union Telegraph Company.

(To be continued.)

The British Telegraph Service.

It is estimated that at the London, England, central telegraph office alone the daily number of telegrams dealt with usually ranges between 120,000 and 165,000, the highest total being 355,353 on the occasion of the railway strike, on September 29, 1919. The total number of telegrams handled is close upon 90 millions. The number of telegraph offices in the United Kingdom is now approximately 14,000 and the record number of words transmitted in one day is 1,885,00, on December 5, 1910.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

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JACKSONVILLE, FLORIDA.

BY G. C. HARRIS.

The name of Jacksonville holds pleasant memories for a host of telegraphers. During the past forty years telegraphers from all parts of the country have worked in the Jacksonville office. From October to March each year positions in this office attract men from other offices further north, and, generally we have with us men who are the pick of the profession.

It was in December, 1882, that the terminal office staff was transferred from Lake City, Fla., to Jacksonville, and of that staff the writer is the only surviving member. Prior to 1882 the relay office for the New York-Havana cable traffic, and the domestic traffic exchanged between the Western Union Company and the International Ocean Telegraph Company, was located at Lake City, Fla.

Four cable operators, W. Blanks, Edward Wood, Harry Stoy, the writer, and one way-wire operator, James McLeod, comprised the force transferred to Jacksonville. Messrs. Blanks and Wood operated the New York end for the Western Union Company, and Mr. Stoy and the writer the Havana end. The cable business was handled over a No. 6 gage iron circuit from New York to Lake City, thence the line ran along the wagon roads to Punta Rassa where it was repeatered into the Key West cable circuit; being again repeatered to the submarine cable at Key West extending to Havana, Cuba. My recollection is that this overland circuit was built especially for this service in the year 1867.

The headquarters of the superintendent, J. G. Thornton, were transferred from Lake City to Jacksonville at the same time. Mr. Thornton had no office assistants.

When the Lake City contingent arrived at Jacksonville we found there John Coyne, manager and operator, and G. E. Mundee, operator, who received the noon and night Associated Press report. The name of one of the two messenger boys was Harvey Granger, and there was a colored lineman by the name of Robert Boler.

At that time the office was located at the northeast corner of Bay and Pine Streets (now Main Street) in two rooms in the south-west corner of the building, the space being about fifteen by eighteen feet. The rooms were reached by a stairway to a hall on the second floor.

The operating room faced south on Bay Street, and the furniture consisted of a quartette table on which were mounted four single Morse telegraph sets, and a small table on which were mounted a set of single line repeaters and two Morse sets. There was also a six-line peg switchboard. The place was lighted by means of a poor quality of water gas which failed us occasionally, requiring resort to candles.

The superintendent's office was in a corner of the second room. In this room also was installed a small telephone switchboard, the operator being A. B. Hernandez.

The main line battery consisted of 250 gravity cells.

At the end of the tourist season, 1883-84, the writer, then located in Chattanooga, Tenn., received a letter from Superintendent Thornton, in which he said: "Just to think of it! fourteen operators were required to handle the business here this season." From those early days until the present there has been a continuous growth in business, until today the traffic amounts to above a million telegrams per month, requiring the services of 250 employees in the traffic department and about seventy-five in the commercial department, exclusive of messenger boys.

The automatic department has grown from one Morkrum circuit to Atlanta, Ga., in 1913 until at the present time there are multiplex circuits to Miami, Tampa, Savannah, Atlanta, Washington, New York, and Chicago; four channels to Atlanta being operated continuously day and night. There is also a Morkrum circuit to Cincinnati, Ohio.

In the Morse department there are three quadruplexed circuits to Palm Beach, Fla., and Titusville, Fla., one each to Savannah, Ga., and Pensacola, Fla. Two duplexed circuits are operated with Daytona, and one duplex each to Key West, St. Petersburg, Orlando, Miami, and Tampa.

Under the supervision of Chief Operator Harrison and his efficient staff of assistants the traffic is handled in a thoroughly creditable manner.

The present supervisory staff includes the following: C. E. Harrison, chief operator; E. P. Washburn, assistant chief operator in charge of automatics; P. H. Brenner, assistant chief operator, Morse; Miss V. King, assistant chief operator, telephone; W. C. Fain, night chief operator; F. M. Houser, late night chief operator; W. R. Shearer, wire chief; D. R. Berrie, night wire chief; S. W. Perkins, assistant wire chief; G. C. Harris, repeater chief; T. W. Blitch, automatic chief; A. H. Russell, chief clerk. In addition, there are supervisors in each department.

About a year ago the company spent a large sum of money renovating the building, improving the interior facilities, enlarging the operating room and providing commodius retiring rooms and various other comforts for the convenience of the employees.

From two employees in 1882 to about 350 in 1920 is a measure by means of which the stupendous growth of the company's traffic in this part of the country may be realized.

COMMERCIAL TELEGRAPH SUPERINTENDENTS WHO RECOMMEND TO MANAGERS AND OTHER EMPLOYEES IN THEIR DISTRICTS THAT THEY READ TELEGRAPH AND TELEPHONE AGE, CONTRIBUTE MATERIALLY TOWARD MAKING EMPLOYEES PERMANENTLY INTERESTED IN THE TELEGRAPH BUSINESS. TELEGRAPH AND TELEPHONE AGE IS AN AGENCY FOR THE GOOD OF THE TELEGRAPH SERVICE, AND IN THIS GREAT WORK THE EDITOR INVITES THE COOPERATION OF ALL TELEGRAPH SUPERINTENDENTS, MANAGERS, SUPERVISORS, CHIEF OPERATORS, AND ASSISTANT CHIEFS.

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AMERICAN TELEPHONE AND TELEGRAPH COMPANY ANNUAL REPORT FOR 1919

That the Bell System has passed through the strenuous period of war conditions with its plant, management and finances intact and is in a healthy condition to undertake its post-war responsibilities with a minimum of delay, is clearly shown by the annual report of the American Telephone and Telegraph Company.

H. B. Thayer, President of the company, gives an interesting history of the details and results of the year's operation not only of the American Telephone and Telegraph Company, but of the whole Bell System.

The report not only shows the component parts of the Bell System and their relationship to one another, but it describes how the system functions in order that each of the associated companies should get the greatest value from the headquarters organization with its accumulated experience and abundant resources. A statement of earnings for the five months' period since Federal control is given more significance than the earnings for the complete year. In normal times the margin of undivided profits at the rate shown in the five months' statement would be considered ample. It compares favorably with any similar period in the system's history, but times are not normal and the commissions are asked to protect this necessary service by granting some increased rates so that the management may be prepared for some increased expenses.

Salaries and wages have been increased to meet the present standards and are believed to be generally fair and sufficient to attract the high class of personnel which is necessary to and has been characteristic of this service.

As in the past, the actions of rate controlling bodies have, in general, been acceptable. There are exceptions, as always, but the tendency is toward more equitable and more sound treatment. It is becoming more clearly understood that in a utility of this sort, which in order to give service must expand with the growth of the community, the test of rates—assuming economy and efficiency—is the return which will attract capital.

"No man and no corporation," says Mr. Thayer, "had a right to expect to come through the great war untouched. Our greatest loss was the loss of these margins for plant growth and reserves of men and women in training. During the war the restriction on the use of capital and material coupled with the unprecedented demand for service, compelled us in some places to exhaust our plant margins and left us at the beginning of 1919 with an actual shortage of plant to meet the then demands. By the end of the year, except in a few localities, the usual facilities were restored."

There is a heavy loss shown during the war in men and women trained for telephone work and in young men in the minor supervisory positions. "Handicapped by this lack of plant and of employees especially supervisory officials, we entered upon the year of the greatest demands upon us," says the report. "Unavoidably, therefore, the service, particularly in congested centers, has been impaired. It is now improving, but it cannot be brought to the pre-war standard until conditions approaching those before the war again obtain. To do as well as has been done, no body of men and women ever labored more loyally in the public service than have the thousands in this service during the past."

The report describes the functions of the department of operation, the legal department, department of development and research, and the department of accounts and finances, all of which are contributing to the devevlopment of the system so that it can meet the greatly increased demands that have been made upon it.

It is shown that the property has been maintained in accordance with the standards of the Bell System and is not allowed to deteriorate and that additional plant is now being rapidly constructed so that in minimum time the maximum efficiency will be available.

Among the new features which are brought out in this report are automatic switchboards which, while more expensive in first cost than manual boards, will do much to offset the increasing cost of giving telephone service.

The toll cable system is being extended westward and is expected to be completed to Chicago by 1923. In co-operation with the Cuban-American Telephone and Telegraph Company plans have been made to lay telephone cables to Havana, so that the principal places in Cuba will be in telephone connection with the principal places in the United States.

Many mechanical labor saving devices have already been adopted to meet the shortage of unskilled labor and other devices are being constantly studied and adapted to the needs of the business.

The report shows what is being done to provide adequate telephone plant and adequate traffic supervisory forces and operators. At one time the turnover in operators reached the rate of 80,000 a year. The adding of so many inexperienced people to the force reacted seriously on the service but the turning point has been passed. Every resource of the Bell System has been brought to bear upon the service problem. In more than half the cities in the country the service has already been restored to normal, and during 1920 a return to substantially normal service is confidently looked forward to throughout the Bell System.

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The stockholders are congratulated on the fact that the properties have come through the war unimpaired as to earnings. As a rule the public has been willing to pay fair rates and rate-controlling bodies ready to authorize them.

The department of development and research during the year has actively prosecuted work upon more than 500 improvements in the telephone art. The patent holdings of the Bell System have increased fully 12½ per cent. during the year, and it now owns or controls, or is licensed under, more than 5,000 United States letters patent and applications therefor.

Special mention is made of the associations of employees which have been organized to maintain a spirit of mutual co-operation and confidence by providing regular facilities for the exchange of views between employees and the management.

There were 15,000 telephone men in war service from the Bell System, and practically all who have applied for reinstatement have been re-employed.

The total amounts of payment under the Employees' Benefit plan for pensions, sickness, accident and death benefits during 1919 was $2,855,008.

During the period of government control increased costs and uncertainty as to the authority of the government to fix rates resulted in failure of the government to earn its compensation. After the return of the properties to the owners a satisfactory adjustment was made with the Postmaster General. At the end of the year the report shows that in the United States there were approximately 11,000 separate telephone companies. Of them 36 are associated companies of the Bell System, 9,403 independent companies whose telephone stations are connected with the Bell System and about 1,500 independent companies whose telephone stations are not connected with the Bell System. There is also a large number of rural lines and associations operated mainly on a mutual or co-operative basis and not rated as companies. Of these lines and associations there are 26,184 which connect with the Bell System.

At the end of the year the number of telephone stations which constitute the Bell System in the United States was 11,795,747, of which 7,739,159 were owned by associated companies of the Bell System. The increase in the total number of stations in the Bell System during 1919 amounted to 729,748.

There were 209,860 employees in the Associated Bell Companies at the end of the year, who are operating 24,162,999 miles of wire of which 94.6 per cent was copper. The net additions to the Bell-owned plant during the year was over $73,000,000.

For the whole Bell System with all duplications excluded the total income, including compensation, after the deduction of expenses amounted to $79,650,186, from which over $27,000,000 was paid in interest and $39,000,000 in dividends, leaving over $12,000,000 surplus. The surplus earnings in the last five months of the year since the end of Federal control have been $7,000,000.

The capital stock, bonds and notes payable of the Bell Telephone System outstanding in the hands of the public at the close of the year were $1,060,000,000, while the net assets devoted to earning return on these outstanding securities amounted to over $1,448,500,000. This is due to the fact that surplus and reserves of over $388,500,000 had been invested in productive property.

For the American Telephone and Telegraph Company the net earnings of the year were over $60,000,000. In round figures, the interest charges were $15,000,000, the dividends $35,000,000 and the resulting balance $9,000,000, of which $5,000,000 was appropriated to reserve for contingencies and $4,000,000 added to surplus. The company and its predecessors have paid dividends to the public at the rate of at least $7.50 per share each year for the past thirty-eight years, and during the past thirteen years the rate has been uniformly $8.00 per share. The number of shareholders in the American Telephone and Telegraph Company was on December 31, 1919, 120,460, an increase of 8,000 during the year. To this number should be added some 9,000 employees of the Bell System who are paying for stock out of their wages. More than 19,000 employees have already paid in full for their stock and are stockholders of record. There are more women stockholders than men.

Statistics Regarding the Telegraph and Telephone Service in Mexico.

The Director General of National Telegraph Lines in Mexico has recently furnished statistics regarding the telegraph and telephone service of that republic. In 1918, the national system was extended 83,229 kilometers. There were 528 telegraph offices, 12 telephone offices, and 21 wireless radio stations in existence. Receipts for the 5,591,453 messages transmitted were 4,195,845 Mexican pesos ($2,097,924, U. S. currency). Disbursements equal to 3,806,102 Mexican pesos ($1,903,051) were made during the year.

SOME folks are born poor; some acquire poverty, and quite a few have it thrust upon them. Poverty is more of a disgrace than it is a disease. Government Savings Stamps purchased every time the pay envelope is opened helps folks to get from the "have nothing" crowd in the "have something" class. Save for a Government Savings Stamp.

THE OLD WIRE CHIEF asks: "If you could bring into being full-grown a man, an exact duplicate of yourself, morally and mentally, would you have him for a companion?"

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SUBMARINE CABLES

PAYMENTS BY CABLE INCREASE.

The apparently interminable drop in most of the foreign exchanges has brought about a greatly increased use of cable transfers for meeting obligations maturing abroad, debtors waiting until the last possible moment to make their remittances, in the hope of getting a better rate.

Even in the days of more stable exchanges, however, there were many possible situations in which one with obligations abroad would find it to his advantage to remit by cable transfer, and such situations will still arise when the recovery of the exchanges commences, unless it is far more rapid than is to be expected at present.

For example, a New York firm has purchased goods in France, giving in payment its acceptance of a 90-day sight draft, payable in Paris. If the firm meets this draft by mail, it must send a franc check fifteen to eighteen days before the draft matures in Paris. But for many reasons the firm may not desire to part with the money just then. It may need the money particularly, or exchange rates may be momentarily high. It therefore waits until a few days before the due date and then purchases a cable transfer from a banker, paying therefor the current rate of exchange "for cables," plus charges for the cablegram. The banker cables his Paris correspondent, who meets the draft.

On the other hand, exporters frequently use this plan for obtaining the immediate use of funds due them from abroad. On turning over his draft on foreign importer for collection, the American exporter may instruct that the proceeds when obtained are to be returned to him by cable.

Again, the exporter may instruct the buyer to pay the purchase price into a bank abroad to the exporter's credit. He then goes to a local bank and sells it his credit at the foreign bank, using the cables to instruct the foreign bank to place the money to his local bank's credit, which then advances the ready cash here.

It is interesting to note that the cable rate of exchange is the real rate, indicating what the dollar here is actually worth *now* in terms of each foreign currency abroad. The check rate, which is the usual rate given when only one is quoted, is the rate for bankers' checks or demand drafts in large amount. It differs from the cable rate in that as allowance for interest must be made between the time checks are drawn and the time the funds become payable abroad on presentation of the check or draft, the check rate is consequently lower. —*Foreign Trade Bulletin.*

Pacific Cable Board.

The report of the Pacific Cable Board for the financial year ended March 31st, 1919, with statement of accounts, shows that the net traffic receipts were £554,511, which exceed those of 1917-18 by £152,537. The increase was the result of war conditions. The expenditure exceeded that of the preceding year by £23,848. During the year over 8,300,000 paying words of international traffic other than local traffic in Australasia and the Pacific were handled. This was over 800,000 words in excess of the total during the previous year, but 439,000 less than the total for 1916-17. Free messages to, from, and in relation to wounded members of the Expeditionary Forces totalled 200,000 words, against 600,000 in the preceding year. In addition to international traffic, 1,830,000 paying words were carried during the year between Australia and New Zealand and between Australasia and the Pacific Islands. Throughout the year there was great congestion, primarily due to the large amount of government traffic. At times it became a matter of great difficulty to control the acceptance of traffic, and government departments and the press were appealed to with the object of reducing their cabling in the interests of the public. The Board is indebted to the press for forbearance during these times of pressure.

The cable section between Norfolk Island and Southport became faulty on August 19, 1918, and repair by the *Iris* was completed on September 5, 1918. A total interruption of the cable did not take place until the ship cut in, but the fault rendered duplex working impracticable. The breakdown of this cable did not have any serious effect upon traffic as it was possible to circulate via Auckland and Sydney all messages which would ordinarily have gone over the Southport cable. During the repair operations the Norfolk Island-Auckland cable was accidentally cut. This led to the discovery of a section in an unsatisfactory condition which would not have been detected but for the accident. The weak spot was cut out and the cable was restored within a few hours. The other cables were maintained without interruption and in excellent condition. The depots, instruments, and plant generally, have continued in good order.

The *Iris* continues in first-class condition, and in addition to the operations at Norfolk Island, carried out two repairs (April, 1918, and November, 1918) to the Cook Straits cables on behalf of the New Zealand Post and Telegraph Department, and repaired one of the cables between Sydney and Wellington for the Eastern Extension Telegraph Co., in October, 1918.

The land line between Montreal and Bamfield, which the Board leases from the Canadian Pacific Railway Co., worked well during the year under review and suffered few serious interruptions. A further line between Halifax (Nova Scotia) and

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Montreal has been leased from the Canadian Pacific Railway for a period of ten years with liberty to terminate the lease at an earlier date on payment of specified penalties. The Halifax connection is worked by the Board's staff and maintained in good order by the Canadian Pacific Railway Co. The Board has direct connection with the terminus at Halifax of the Imperial Atlantic Cable, which is also operated by the Board's staff, the English end being operated by the British Post Office. The land line in Australia, between Sydney and Melbourne, which is operated by the Board's staff, gave very satisfactory service throughout the year.

CABLE STAFF CHANGES—PACIFIC CABLE BOARD.

J. N. Gormly transferred from Southport to Sydney; E. J. Parkinson, Sydney to Suva; H. K. Greenhill and J. Kerr, Suva to Bamfield; G. R. Weston, Bamfield to Norfolk Island; A. N. Smales, G. S. Watt and W. Wardrop, Auckland to Suva; H. F. Wilton, Southport to Suva; J. Lang and T. Light, Montreal to Halifax, and R. P. Heron from Suva to Fanning Island.

Earthquake Interrupts Cable.

During the first week in March some of the submarine cables along the west coast of South America were interrupted due to earthquakes. Cables between Iquique and the Peruvian border were interrupted for a short time, but the delay to traffic was not serious.

Western Telegraph Co., Ltd.

The directors have decided to pay in March a dividend of 2½ per cent., and in the subsequent quarter a similar dividend, the intention being to pay a final dividend of 3½ per cent., making 10 per cent., free of tax, for the year, paying no bonus. One hundred thousand ordinary shares are to be issued to meet expenditure which is being incurred to add to and improve the cable services. They will be offered at par to shareholders.

Eastern Telegraph Co., Ltd.

The directors have decided to pay in May a final dividend for 1919 of 5½ per cent., making 10 per cent. for the year, free of tax, paying no bonus. £1,000,000 ordinary stock is to be issued to meet expenditure which is being incurred to add to and improve the cable services. It will be offered at par to holders of the ordinary stock.

Eastern Extension Australasia and China Telegraph Co., Ltd.

The directors have decided to pay in May next a final dividend for 1919 of 5½ per cent., making 10 per cent. for the year, free of tax, paying no bonus. One hundred thousand shares are to be issued to meet expenditure which is being incurred to add to and improve the cable services; they will be offered at par to shareholders.

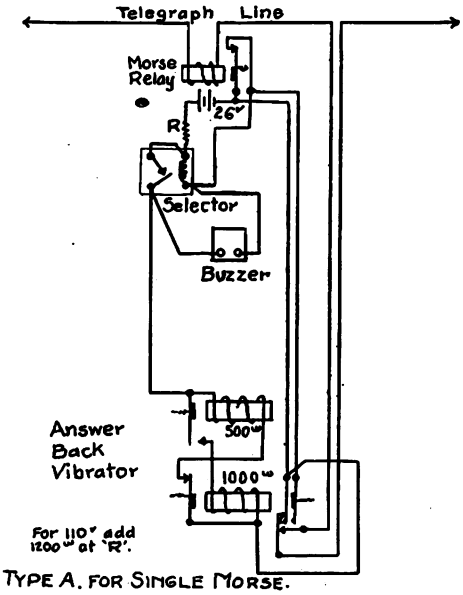
ANSWER-BACK SIGNAL FOR MAIN LINE SELECTORS.

The illustration presented herewith shows an answer-back signal arrangement for main line selector calls.

The Gill selector as originally used had an answer-back arrangement which was operated mechanically; returning a combination of line impulses each time the selector was operated. The objection to this scheme was that it was not under control of other stations on the circuit.

The device here illustrated was invented by Stanley Rhoads, telegraph and telephone engineer of the New York Central Railroad, being covered by United States patent No. 1,309,369, issued on July 8, 1919, and is in use on New York Central telegraph circuits.

It may be noted that the contacts of a vibrator hold the selector circuit closed when the line circuit is open. The novel feature of the device is that the selector may be operated from any station on the line, and, likewise, may be cut off by any office simply opening the line key.



TYPE A. FOR SINGLE MORSE.

ANSWER-BACK SIGNAL.

The device has been given a thorough test in service and has proved satisfactory. A long circuit equipped with the arrangement is the New York-Chicago train report wire of the New York Central Railroad, which is a single Morse circuit with six repeaters, and with selectors at all important stations. The train dispatcher is stationed at the New York end and the answer-back signal informs him when the selector at any desired station operates.

When used on duplexed circuits equipped with selectors the operation of the signal relay controls the operation of the transmitting pole-changer.

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Radio Telegraphy

INAUGURATION OF TRANSATLANTIC COMMERCIAL RADIO TELEGRAPH SERVICE.

President Nally Announces Opening of Long Distance Radio Service Upon Return of Stations From Government Control.

E. J. Nally, president of the Radio Corporation of America, on March 1, issued the following statement announcing the inauguration of commercial radio service through the coastal stations of his company:

"Promptly at midnight the transoceanic stations of this company were turned over to us by the United States Navy Department, in accordance with the proclamation of President Wilson, directing the return of all private radio plants to their owners.

"At 12:01 a. m. the first marconigram was transmitted by our New Brunswick, N. J. station, and was received at Carnarvon, Wales. This marked the opening of direct commercial communication between the United States and Great Britain for the first time in the history of wireless

"The first three messages transmitted from our New Brunswick station are quoted below, in the same order as they were sent:

March 1, 1920.

Godfrey C. Isaacs, Managing Director,
Marconi's Wireless Telegraph Co., Ltd.,
London.

May this first message which opens commercial wireless service between America and England mark an epoch in history from which the achievements of the future shall date. Communication is the leverage which shall lift the world to better understanding and thus lead to closer ties of friendship between all nations. It is the mission of our respective companies to so strengthen and improve the wireless service that distance shall be made negligible and communication practically instantaneous.

Edward J. Nally, President,
Radio Corp. of America.

March 1, 1920.

President of the Chamber of Commerce,
London.

Now that the war controls have ceased and the Radio Corporation of America has been honorably discharged from the service, we foresee closer and quicker business association and we are confident that this new means of prompt communication and understanding will enable the business men of New York to work more closely with the business men of London, not merely to the advantage of themselves but for the greater progress and benefit of civilization.

Alfred E. Marling, President,
New York Chamber of Commerce.

March 1, 1920.

Imperial Commercial Association,
4 Callus Street, London, EC 3.

Upon the occasion of the opening of commercial wireless service between the United States and Great Britain the Merchants Association of New York desires to extend to the Imperial Commercial Association of London its cordial greetings and its good wishes for the continued growth and success of your esteemed organization and further to express the hope that the hearty cooperation with our association which has existed in the past may continue in the future.

William Fellows Morgan, President,
The Merchants Association of N. Y.

Edward J. Nally, President,
Radio Corporation of America,
Woolworth Building, New York City.

Your first message by the new direct wireless service between America and England expresses exactly the desires animating the activities of everyone here. We are certain that this day will pass into history as one upon which was forged a most valuable link of communication between the English speaking peoples of two great continents. The British nation wholeheartedly desires the closest possible friendship with the United States of America and my company imbued with the national sentiment will spare no pains in contributing to the fulfilment of this desire by assisting in the provision of practically instantaneous means of communication.

Godfrey C. Isaacs, Managing Director,
Marconi's Wireless Telegraph Co., Ltd.

"The United States-Great Britain circuit has been operating continuously since midnight, and a great number of commercial messages between the two countries are being handled over this circuit.

"On the Pacific Coast, our high power stations at Marshall and Bolinas near San Francisco, California, commenced operation promptly at midnight, with their complementary stations at Kahuka and Koko Road, in the Hawaiian Islands, and with the Imperial Japanese Government's station at Fanabashi, Japan.

"Marconigrams are now being flashed over the Atlantic and Pacific Oceans by the high power stations of the Radio Corporation of America."

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International Radio Telegraph Company Resumes Commercial Operations.

With the return of all commercial radio telegraph stations to their owners on March 1, the International Radio Telegraph Company resumed operation of its powerful station (WCG) at the Bush Terminal Building, Brooklyn. The company will carry on a continuous, day and night service, handling radiograms to and from coastwise and transatlantic vessels.

The general offices of the company are at No. 326 Broadway, New York.

Institute of Radio Engineers Officers for Year 1920.

The annual election of officers of the Institute of Radio Engineers resulted in the following being placed in office for the year 1920: John V. L. Hogan, president; E. F. W. Alexanderson, vice-president; Warren F. Hubley, treasurer, and Alfred N. Goldsmith, secretary. The Board of Direction of the Institute is made up of the officers and the following managers: Major General George O. Squier, W. H. G. Bullard, E. H. Armstrong, Robert H. Marriott, David Sarnoff, Donald McNicol, Lloyd Espenschied, and Fulton Cutting.

Federal Telegraph Company.

The Federal Telegraph Company, originally organized to do a radio telegraph business between cities on the Pacific coast, from 1911 until the start of the war (when the Government prohibited the use of commercial radio stations) built up a considerable volume of business. When the radio stations of the company were taken over by the Government operation was continued between certain Pacific coast cities over land line wires leased from the Pacific Telephone and Telegraph Company. The Federal Company is now by legal action seeking to enjoin the wire company from discontinuing the wire service. The company claims that it is handling 50,000 telegrams per month between coast cities, bringing in a gross annual income of $450,000. Sixty-five per cent of the traffic is handled between San Francisco, Calif., Portland, Ore., and Seattle, Wash.

Radio Research Board.

A Radio Research Board has been established by the Department of Scientific and Industrial Research in Great Britain to co-ordinate and develop researches into wireless telegraphy and telephony at present being undertaken by government departments, with the following membership:—Admiral of the Fleet, Sir Henry B. Jackson, F.R.S., chairman; Commander J. S. Salmond, R.N., Lieut-Col. A. G. T. Cusins, Wing-Commander A. D. Warrington Morris, Mr. E. H. Shaughnessy, and Prof. J. E. Petavel, F.R.S., representing the Admiralty, War Office, Air Ministry, Post Office, and Department of Scientific and Industrial Research, respectively, and Prof. Sir Ernest Rutherford, F.R.S.

Radio Engineers Meet.

THE INSTITUTE OF RADIO ENGINEERS at its regular meeting held in the Engineering Societies Building, New York, on the evening of March 3, was addressed by John V. L. Hogan, president of the Institute on the subject "Problems of Radio Regulation." Mr. Hogan discussed the gains to be secured by proper supervision, the undesirability of certain forms of legislation on radio matters, and, broadly, the technical aspects of radio communication which bear upon regulation by the Government.

The discussion which followed the presentation of Mr. Hogan's paper was thorough and interesting. Admiral W. H. G. Bullard, who was present, reviewed the work of the Navy Department during the three years the commercial radio stations were under Government control. At the present time there are 168 Navy radio stations and five commercial stations in operation. Admiral Bullard called attention to inadequacies in the radio law of 1912, and in the course of his remarks stated that while the commercial radio stations turned back to their owners on March 1, are subject to the law of 1912, the Navy Department stations are not subject to the provisions of that law.

Expressing his personal views, Admiral Bullard favored the establishment of a Radio Commission, to be composed of naval, postoffice, commercial and manufacturing representatives. Later in the evening a similar view was expressed by Lieut. Col. J. O. Mauborgne of the Chief Signal Officer's Department at Washington. Both officers thought that the Commission should have as its head the Secretary of Commerce.

Admiral Bullard, in his remarks, pointed out the need for practical licensing and regulation of radio stations. He deprecated the establishment of radio stations for the purpose of communication between points now properly served by wire communication. Such stations, he believed have little excuse for existence and add unnecessarily to interference difficulties. He is not in favor of maintaining radio, telegraph service between a station in New York and a station in Philadelphia for the purpose of ordering the shipment of "socks and collars."

Other radio engineers present who contributed interesting discussion were: Emil J. Simon, David Sarnoff, Dr. A. N. Goldsmith, and Lester Israel.

THE RADIO COMMUNICATION COMPANY, managed by Emil J. Simon, well known radio engineer, has established a commercial station (WSK) at Jamaica, Long Island, for the reception and transmission of radiograms from and to coastwise and transatlantic vessels.

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THE TURNING BACK OF the long distance radio stations belonging to private interests on March 1, imposed a heavy burden on the technical and traffic staffs of the radio companies. With but two weeks' notice the commercial companies had to familiarize themselves with plant changes made by the Navy Department during the past three years. Also, while the Navy Department was in a position to employ the patented devices of any company or individual, the commercial companies are not so privileged; it being necessary, of course, for them to use only such apparatus as is covered by their own patents. The "turnover" cooperation between Navy Department staffs and the commercial companies' staffs, on March 29, and during the days following, was as satisfactory as was possible under the circumstances. During their stewardship the Navy Department staffs performed highly patriotic service, and in a manner which they regarded as thoroughly efficient.

German News Distribution.

A large and representative meeting of the German press organizations met the postal authorities on December 22, 1919, to discuss the results of some months of tentative experiments in the matter of disseminating news to the various agencies by wireless telegraphy, and came to the conclusion that in its present state wireless telegraphy could not meet the needs of the press. On the other hand, it appeared suitable for dispatching generally interesting news in duplicate. The assembly was also of opinion that dispatch of such news could take place to a large extent if wireless telegraphy were replaced by wireless telephony to obviate the necessity for appointing special wireless telegraphists. The assembly will meet again shortly to report on the further development of experiments with telephony.

Elektriska Industri A.-B., in Stockholm, and the Berlin firm Dr. Erich F. Huth Gesellschaft für Funkentelegraphie, have come to an agreement as to a mutual exchange of patent rights in connection with wireless telegraphy and telephony. The agreement is expected to prove of great value to Sweden, especially as regards wireless telephony.—*Economic Review.*

New Radio Call Book.

The Consolidated Radio Call Book, which contains 2,500 calls in addition to those listed in the Berne Bureau's call book of April, 1918, is now ready for distribution. The book will be of great value both to the amateur as well as the professional radio operator. In addition to the complete list of radio ship and shore station calls of all nations the book contains a large amount of information relative to radio traffic handling, rates, etc. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, at $1.00 per copy.

Radio Corporation of America Notes.

SCHUYLER R. FORD has been appointed engineer in charge at the New Brusnwick, N. J., high-power station. Mr. Ford was recently released by the Navy Department after having served as officer in charge of the Sayville, L. I., radio station.

JACK L. GOLDMAN, during the war chief electrician in the U. S. Navy, is now in the service of Emil J. Simon, Radio Construction, New York, as construction engineer.

WALTER C. GRAHAM, during the late war engaged in the naval radio service abroad, has been appointed consulting engineer and professor of electrical engineering for the International Correspondence Schools of South America.

L. PEDRO GALLARDO, inspector of radio telegraph service in Chile, South America, has been placed in charge of all Chilean radio stations.

HUMBERTO SOLARI-Y-EURTADO has been appointed engineer in chief of the radio communication service of Peru, South America.

IN COLOMBIA, South America, the government has accepted the invitation of the Marconi Company to send a number of young Colombians to study wireless telegraphy in the company's works in England, so they may be qualified to take charge of the radio stations the company is to install for the Colombian government.

MATERIAL and equipment for the installation of radio telegraph stations at Guayaquil, Quito, and Esmeraldas, Ecuador, has been delivered at the sites of the stations by the Societe Francaise Radio Electrique, of France, this company having been granted the contract for the building of the stations.

IN COSTA RICA, at the end of the year 1918 the number of telegraph offices in the Republic was 122. The number of telegrams handled during the year was 416,831. The receipts amounted to about $122,000. At the end of 1918 the number of telephones was 1,514. The wire mileage was 2,289.

IN GUATEMALA, the President has issued orders reducing the telegraph tariff on telegrams written in Spanish, not written in code or cipher, and addressed to offices in the Republic or to any point in Central American countries. For telegrams written in cipher, code, or foreign languages, the existing rates are doubled.

IN CUBA the collections of the Department of Communications for November 1919 showed an increase of about eight per cent. over the collections for the corresponding month of 1918.

IN ARGENTINA, South America, a large appropriation has been made to provide for the erection of a new postal and telegraph building in the city of Bahia Blanca.

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QUESTIONS AND ANSWERS

Operators' "Sines"

F. L. D.—Prior to the year 1866 it was not customary for individual operators to employ personal signals. The custom was simply to OK the receipt of messages by giving the office call. By 1866 the traffic had grown so that in order to trace errors in messages and to impose individual responsibility upon operators in offices where more than one man was employed the rule was established that each operator should select a personal signal of one or two letters by means of which he might be identified in wire work.

North American Telegraph Company.

J. J. L.—The North American Telegraph Company first operated circuits between St. Paul, Minneapolis and Duluth, in Minnesota, on July 1, 1886. On August 23 of the same year connection was made between Minneapolis and Chicago.

The Rule of Three.

W. C. L.—The "single rule of three" is a rule of arithmetic, and is the same as proportion. It is the process of finding from three given numbers the value of a fourth, to which one of them shall have the same ratio as exists between the other two. For example: If five men can do a given piece of work in four days, how long will it take ten men to do the same work? According to the rule of proportion this is stated as follows:

$$10 : 4 :: 5 : x$$

that is, ten is to four as five is to x, the unknown quantity. This is solved by multiplying the "means," 4 and 5, and dividing by the "extreme," 10; thus we have—

$$\frac{4 \times 5}{10} = 2, \text{ which is the value of } x$$

Morse Duplex Operation.

J. T. W.—In the operation of duplex and quadruplex apparatus, and of printing telegraph circuits, it is often found necessary to "split up" a condition of off-balance due to difference of artificial line balance between positive and negative battery applications from the distant terminal station. There are several reasons for this, all of which apply in different cases. A transmitter sending out positive and negative currents in response to the backward and forward movements of an armature may appear to be properly adjusted while, in fact, the positive or the negative contact may be of slightly longer duration than the opposite battery contact. On a single wire, it is possible that at some point along the line current of one sign is leaking into the circuit, and if the potential is of only a few volts this will cause unevenness of line potentials, the result being that as the distant station presents one polarity to line a different balancing resistance is required than obtains when he presents the other pole; also, it is common experience to find a ground potential between two terminal stations of from two to ten volts, and as this generally is of constant sign, this potential is added to the applied battery when the same polarity is to line and opposes the applied battery when the opposite pole is to line. The three tests which will give you a line on the difficulty are: Conductivity test with both poles of the battery; insulation test, figures being noted from both polarities; and test for difference of potential between terminals, line grounded each end.

The Goslin Quadruplex Telegraph Circuits.

F. L. T.—Mr. Goslin's quadruplex arrangement has the neutral side main line relay and the polar side relay in series in the bridge circuit. The armature of the neutral relay is also subject to the attraction of a holding magnet bridged between main and artificial lines in series with an adjustable condenser, otherwise the connections are the same as in the standard Western Union bridge quadruplex. The Goslin arrangement is in use on Western Union circuits and on a number of railroad lines.

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Students' Course in Technical Telegraphy

ARTICLE No. 1.

This is the first of a series of articles which will appear in the successive issues of TELEGRAPH AND TELEPHONE AGE and which, it is hoped, will prove of great value to the younger men in the service who desire to qualify for advancement in the operating departments of the telegraph companies and in railroad telegraph service. The nature of the lessons will be such that older men who so far have neglected to take up systematic study may gain a working knowledge of the theories involved in telegraph and telephone circuit operation.

It has been well said that "*The practical electrician must know how much current and how much resistance,* or he knows nothing." It is the intention in the early chapters of this course to go thoroughly—although in an elementary manner—into the subject of electric circuits, describing all practical circuit arrangements in relation to current and resistance.

The subject-matter is designed to instruct telegraph employees to understand telegraph circuits. Each type of circuit dealt with, and each factor of electric circuits described, shall be illustrated by diagrams of circuits used in telegraph and telephone work. There shall be included in the course nothing beyond the ability of the average telegrapher to understand.

If the lessons as they appear in each issue are read carefully the student should find in the course of a few months that he will be qualified to take up the study of the more complex circuit arrangements, and to understand the operation of all apparatus used in modern telegraphy and telephony.

The early lessons will deal with fundamentals, and as these fundamentals shall be handled in direct relation to telegraph work, progress should be made from the start. No time shall be devoted to the study of either elementary or advanced electrical theories which do not concern communication circuits.

TYPES OF ELECTRIC CIRCUITS.

Circuits used in telegraph operation have various forms, each form designed for particular purposes. The most common forms are: Series, multiple, parallel, shunt, leak, loop, main, and local circuits.

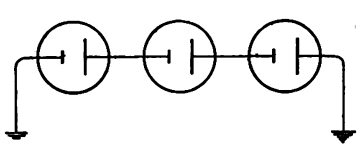

FIGURE 1.

Figure 1 illustrates a series circuit. The diagram shows three cells of primary battery, say dry cells, connected in series. The heavy line in each circle represents the carbon element of the cell and the smaller line the zinc element of the cell. With the cells connected in series it may be noted that the carbon terminal of the cell on the left is connected with the zinc terminal of the cell next on the right, and so on through the third cell. The cell on the left has its zinc terminal connected to ground and the cell on the right has its carbon terminal connected to ground; thus there is a continuous electric circuit, through the battery in one direction and through the earth in the reverse direction, making up what may easily be recognized as a series electric circuit.

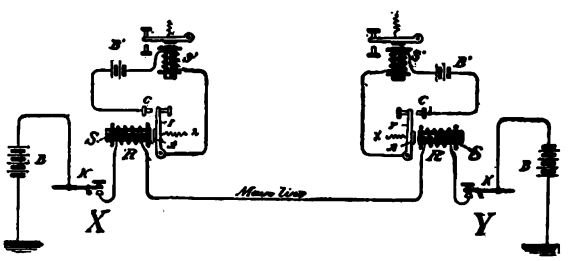

FIGURE 2.

SIMPLE MORSE CIRCUITS.

Figure 2 illustrates a series circuit easy to understand. This diagram also includes a main circuit and a local circuit, as well as a grounded circuit and a metallic circuit.

The diagram represents a single Morse telegraph circuit with main line relays connected at terminal stations *X* and *Y*, and with no intermediate relays or offices in circuit. At each terminal office *B* represents the main line battery; *K* represents the sending keys in the main line circuit; *R* represents the relays; *S* the sounders, and *B'* the local batteries used to operate the sounders.

It may be observed that the two separate main line batteries are connected in series; that is, the carbon (or copper) of the battery at one end is to line while the zinc of the battery at the other office is to line. This signifies that, taken as a whole, the cells are connected in series. Were the separate batteries to be connected so that the zinc terminal, or the copper terminal, would be to line at each end there would be no current in the line wire, as the battery at one end would then oppose the battery at the other end.

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Figure 2, also, so far as the main line circuit is concerned, represents a grounded circuit, inasmuch as the wire is grounded at each terminal instead of a return wire being used to complete the circuit between the two stations. Were a return wire employed instead of the earth we would then have a metallic circuit instead of a grounded circuit.

The armature *A*, of the relay at each station is shown connected in series with the electro-magnet of the sounder and the local battery *B'*, by way of the closed contact point *C*. When the relay is energized (main line keys at both terminal stations closed) the armatures of the relays will be attracted toward the relay magnet cores, and this action causes the armatures to come into contact with *C*, thus closing the local sounder circuits. The sounder circuit, it may be noted, is a metallic circuit.

It is important to remember that a correct mental impression of each type of electrical circuit is of great value in grasping the fundamental principles of electrical engineering, and the terms used in this lesson, dealing as they do with simple telegraph circuits, nevertheless hold true in the most advanced electrical studies.

Also, we remind the student that a second reading of a lesson will bring him firmer impressions and make plain to him things which in the first reading may have seemed somewhat hazy.

(To be continued.)

Experimental Wireless Stations.

EXPERIMENTAL WIRELESS STATIONS. By Philip E. Edelman, 272 pages; 98 illustrations.

This book is intended particularly for experimenters in wireless telegraphy as a guide to a rational study of the art. One of the main objects of the book is to provide a standard design for so-called amateur stations, to take the place of the many varieties of hit and miss apparatus constructed and purchased by experimenters.

The matter has been written with particular regard to clearness, simplicity and direct usefulness, and among the subjects covered are: Nature and theory of wireless transmission; aerials; grounds and lightning protection; general features of transmitters; resonance; calculation of wave length, capacity and circuit; transformers; spark coils; transmitting condensers; design and construction of spark gaps; detectors; solid rectifiers; tuning; interference prevention; right of the experimenter, etc. A supplement contains much matter of value, which brings the book up to date and explains the audion, time signals, balancing aerials, vacuum valves, amplifiers, etc.

Copies of this book may be purchased for $1.50 each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

ONE of the most important things any one can do this year is to live within his income and salt away a bit of it on Government Savings Stamps for safe keeping. Save for a Government Savings Stamp.

International Telegraph and Telephone Conference.

It was announced on February 28 that the following named persons have been appointed representatives of the Government of the United States to participate in an international conference to be held in Washington D. C., in the near future to consider international aspects of communication by telegraph, telephone, submarine cable, radio telegraphy and radio telephony. It is intended that the conference shall make recommendations with a view to providing the entire world with adequate facilities for international communication on a fair and equitable basis:

Albert S. Burleson, of Texas, Postmaster General.

Rear Admiral William S. Benson, United States Navy.

Walter S. Rogers, of Illinois.

In Memory of Volta.

A movement has been started in Italy looking to the erection of an appropriate monument to the memory of Alessandro Volta, the great Italian who was first to construct a primary source of direct current—the Voltaic pile. It is the intention to have the monument ready for unveiling in the year 1927, the hundredth anniversary of Volta's death.

All Books not Dry.

An express agent sent a telegram to the consignee of a received express shipment, reading: "Box of books received, advise disposition, leaking badly."

Cable Codes.

TELEGRAPH AND TELEPHONE AGE is headquarters for all cable cipher codes. Telegraph managers would do well to bear this fact in mind when customers make inquiries regarding such codes. We are prepared to furnish full information on the subject, our knowledge being based on over thirty-five years' experience in handling the hundreds of codes on the market. Address TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Submarine Cable Testing.

We have received a supply of "Darby and Fisher's Students' Guide to Submarine Cable Testing," fifth edition, one of the most popular books on this important subject.

The book contains 240 pages and deals with all tests and measurements made in modern submarine cable practice. An appendix is included which contains answers to all questions presented in the main work.

The price of the book is $4.50 and copies may be had from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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INDUSTRIAL.

Japanese Imports and Exports of Telegraph Apparatus.

Interesting figures are now available showing the 1917 and 1918 imports and exports of telegraph and telephone apparatus into and out of Japan.

The figures are in yen (a yen is worth about fifty cents in American gold):

TELEGRAPH AND TELEPHONE INSTRUMENTS AND PARTS.

Imported from	*1917*	*1918*
Great Britain	7,000	1,000
France	1,000	1,000
Denmark	3,000	14,000
United States	50,000	75,000

TELEPHONES AND PARTS THEREOF.

Exported to	*1917*	*1918*
China	203,000	182,000
Kwantung Province	67,000	172,000
Hong Kong		4,000
British India	3,000	4,000
Dutch India	1,000	42,000
Asiatic Russia	131,000	12,000
Philippine Islands		1,000
New Zealand		1,000

Also, Japan imported from the United States voltmeters and am-meters to the amount of 217,000 yen in 1918, an increase of 53,000 yen over the previous year. In 1918 the imports of meters from other countries amounted to only 1,000 yen.

National Conduit and Cable Company.

The National Conduit and Cable Company reports a deficit of $1,116,340 for last year, as compared with a deficit of $860,822 in the preceding year. Sales were $10,557,836, whereas in 1918 they were $14,011,664. There was a loss from operations last year of $621,970, as compared with a surplus after operations in 1918 of $520.703. The balance sheet shows a reduction of about $1,300,000 in inventory.

H. J. Pritchard, President, in commenting on the report for last year, says:

"This period was largely one of readjustment. Price fluctuations in copper were such as to bring about a curtailment of demand for copper products. A lack of stability also existed in the brass industry, due both to fluctuation in price of metals and to the necessity of absorption of the large supply of Government-owned brass on hand at the time of the signing of the armistice.

"While these difficult trade conditions prevailed, improvements were begun at the company's plant which the general survey that had been made demanded. These improvements, embracing additions to machinery, rearrangement of departments, changes of methods, and other betterments toward greater production, are now in progress, and we feel confident that they will result in a lower manufacturing cost and an increase in production.

"The orders received in 1920 to date are larger in volume and are more favorable than those received in the corresponding period of 1919."

Japanese Manufacture of Electrical Porcelain.

One of the newer developments in the pottery industry is the manufacture of electrical accessories in connection with the rapidly expanding electrical industry in Japan. The large high-tension insulator demanded by hydroelectric development are made both in large factories such as the great Morimura plant at Nagoya and also by small individual workshops (on subcontracts) in villages.

The large pole insulators are thrown on an ordinary wheel which usually is motor driven. When shaped they are passed to a second man who turns them to size with a tool. Finally they are carefully finished by hand before drying. They are glazed in the clay and fired once. One man carrying through all the processes will throw, turn, and finish 400 insulators in a day, for which he gets about 1.70 yen (including a rice stipend).

Smaller white porcelain goods, insulators, cleats, rosettes, etc., are for the most part manufactured in Japan in the households alongside of dolls and teapots. They are molded in plaster of Paris molds, with a lavish expenditure of time and energy, from clay purchased ready for working, and are then fired in community kilns. With practically no overhead charges, such small manufacturers are able to compete successfully with modern factories. In fact, one large establishing which put in an insulator factory has been undercut in price by the small independent potters to such an extent that it has almost ceased to do business.

THE ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES will hold their annual convention in New York City on March 18.

"The Wire Devils."

The above is the title of a new book written by Frank L. Packard, author of several well known popular novels. In "The Wire Devils" Mr. Packard has produced a book based upon the surreptitious use of a railroad company's telegraph wires for criminal purposes. The "gang," composed of ex-telegraphers and ex-linemen, stage many exciting events which keep the railroad company's detective force on the jump day and night for a long period.

The deviltry of the stunts arranged by the ex-operators is palliated somewhat by a romantic and chivalrous streak in the makeup of "The Hawk," who is the chief plotter. The book contains more sudden twists of fortune and exciting moments than any telegraph novel ever before written.

The price is $1.50 per copy, and it may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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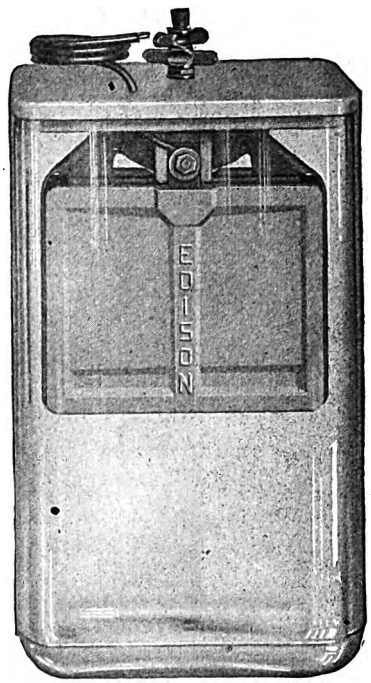

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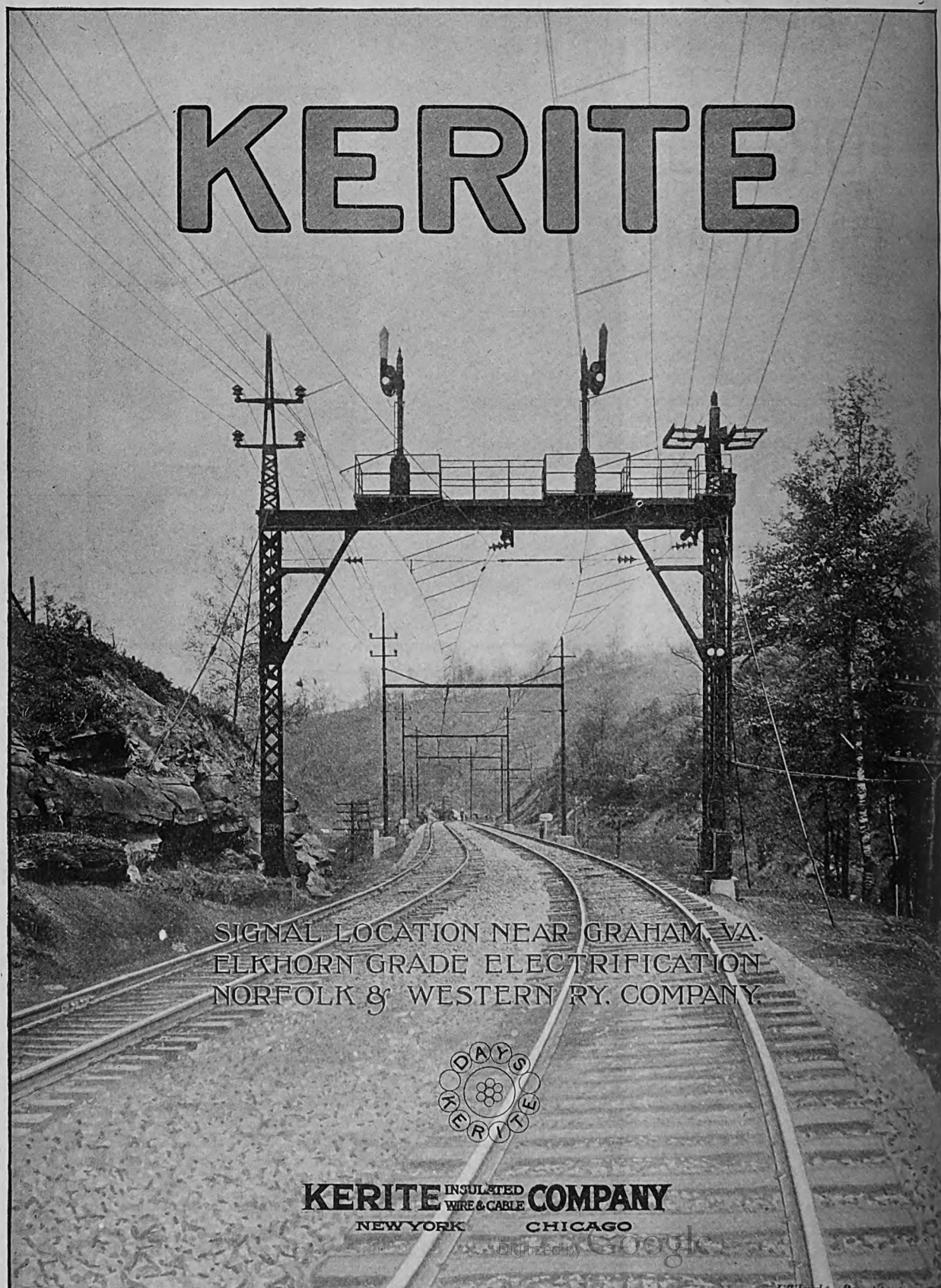

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THE RAILROAD
TELEGRAPH AND TELEPHONE

H. HULATT, manager of telegraphs, Grant Trunk, and Grand Trunk Pacific Railways, Montreal, Que., was a New York business visitor on March 8.

W. H. HALL, superintendent of telegraph, Missouri, Kansas and Texas Railroad System, has found it necessary temporarily to relinquish some of his duties on account of illness.

THE TELEGRAPH AND TELEPHONE DIVISION, American Railroad Association has arranged for a meeting of the Committee of Direction to be held in Chicago on March 17.

G. A. CELLAR, heretorfore superintendent of telegraph, Pennsylvania Railroad Lines, west of Pittsburg, Pa., has been appointed general superintendent of telegraph of the entire Pennsylvania System, with headquarters at Philadelphia, Pa.

W. H. GIPE, manager of the C. C. C. & St. L. Ry., general telegraph office at Indianapolis, Ind., died of pneumonia on February 27. Mr. Gipe entered the service as messenger boy twenty years ago in the office of which he finally became manager.

JOHN MCMILLAN, manager, Canadian Pacific Railway Company's Telegraphs, Montreal, Que., was a New York business visitor on March 3.

A CONFERENCE of telegraph operating and traffic officials of the Canadian Pacific Railway's Telegraphs, was held in Toronto on March 13. Various subjects related to plant and to traffic handling were discussed.

W. C. PELLATT has been appointed telephone engineer of the Northern Pacific Railroad in the office of Superintendent of Telegraph E. E. Dildine, St. Paul, Minn., vice M. J. Hansen, resigned. Mr. Pellatt was formerly in the service of the Tri State Telephone and Telegraph Company.

J. E. DREWRY is telegraph inspector for the Illinois Central Railroad at Memphis, Tenn.

JAMES B. HERLIHY, telegrapher in the fast freight department of the general manager's office, New York Central Railroad during the past four years, died on January 15. Mr. Herlihy had been in the company's service nineteen years.

O. C. GREENE, for many years superintendent of telegraph of the Northern Pacific Railroad at St. Paul, Minn., intends sailing from New Orelans on March 20 for Carozal, Canal Zone, where his son, Curtis Greene, is engaged in engineering work.

Baltimore and Ohio Railroad.

THE BALTIMORE AND OHIO EMPLOYEES MAGAZINE, for March, contains an illustrated article written by C. A. Plumly, superintendent of telegraph, entitled "Seventy-six Years of Telegraph Development," in which is given a historical review of the invention of the telegraph. Two photographic reproductions give views of pole lines along the Baltimore and Ohio Railroad, showing modern construction.

JOHN KRAPF, operator at a tower office, has been awarded recognition on the company's Safety Roll of Honor for having exercised superior judgment in handling difficult wire conditions between his office and a neighboring station. His skill and promptness helped materially the movement of trains which otherwise would have been seriously delayed.

C. S. WOLFE, telegrapher, on January 22 received a letter of commendation from the company in recognition of his discovery of a broken rail while walking along the track on his way home from duty. He returned to the telegraph office and reported the defect.

The Drawing of Plans and Diagrams.

An excellent book on the subject of engineering drawing is Engineer Draughtsmen's Work, a pocket size book of ninety-six pages which describes the use of drawing instruments; how to do sketching, designing, leveling and surveying; how to handle drawing paper, blue prints and tracings. The book also contains suggestions for the branches of scientific knowledge advisable to be studied by draughtsmen.

The price of the book is $1.00, and copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Brodway, New York.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY.

NEWCOMB CARLTON, president, returned from Europe on March 7, where he has been during the past two months on a business mission.

GEORGE D. PERRY, general manager, Great North Western Telegraphy Company, Toronto, Ont., was a New York visitor on March 1.

THOMAS E. FLEMING, of General Manager Carroll's office has returned to his desk after a short absence on account of illness.

S. M. BARR of the engineering department, New York, is in San Francisco in connection with proposed plant improvements.

E. M. FISK, of the engineering department, has gone to Kansas City, Mo., in connection with the new main office work.

W. V. MCGUINNESS, engineer, has gone to Dallas, Tex., in connection with plant improvements.

THE ANNUAL MEETING of the Telegraph and Telephone Life Insurance Association, held at No. 195 Broadway on March 10, was attended by delegates from various cities.

H. W. SHELDON, formerly automatic chief operator at Kansas City, has been appointed chief operator at Des Moines, Iowa, vice F. R. Porter, resigned.

E. F. SWEETSER, manager of the Western Union office at Helena, Mont., is chairman of the Publicity Committee of the Commercial Club of that city. Among the plans for future publicity work which the Club proposes to undertake is one which has in view educating everyone in the United States to pronounce the word Helena correctly. Too many people pronounce the word with the accent on the second instead of the first syllable.

New York Western Union.

G. W. ALVIS, heretofore repeater attendant on the night force, has been assigned to a day shift.

A. M. GARDNER AND J. H. TWYFORD have been assigned to the Southern switchboard.

THE ASSOCIATION OF WESTERN EMPLOYEES entertainment and dance held at the Palm Garden on February 24 was attended by a large representation from all departments of the service. Company officials and association officials who were present included S. B. Haig, J. P. Edwards, G. C. Gute, A. M. Lewis, J. J. O'Keefe, Gertrude McMullen, Farrell Sheridan, Edward Oakley, J. V. Troy, J. Cashman, J. Sears, Alice Knuff, Irene McNally, Edna Conroy, J. F. Nathan, J. F. Hyland, R. F. Murphy, C. S. Spree, L. Fidehey, Blanche Hoff, Mr. Breslin, P. O. Purcell, Charles Kilfoyle, and William J. Quinn.

THE WIRE CLUB OF NEW YORK, on invitation of Col. I. D. Hough, attended an illustrated lecture on February 25 in the auditorium of the Engineering Societies Building, given by Brigadier General Edgar Russel. Moving picture scenes were reproduced showing war operations in France.

S. E. MOYER has returned to duty after being laid up for a time with pneumonia.

THE MULTIPLEX PLANT SCHOOL graduates held a banquet on February 26, followed by a theatre party. Among the graduates who attended were H. Waterstreet, C. Cook, W. Tilson, R. Dunn, F. De George, E. J. Papacena, H. Lemkie, E. De Quesada, A. Rinskie, K. Baumgarten, J. Medico, and W. Singer.

Pittsburg, Pa., Western Union.

MISS LOU J. OUDERKIRK has been appointed manager of the re-opened branch office in the Wabash Building, Pittsburg, Pa.

JOHN HILL AND J. E. ARMSTRONG, of General Manager T. W. Carroll's staff, were in Pittsburg several days recently on business connected with the service.

CHARLS V. BERNY, repeater chief on the all night force, Pittsburg main office, was married on February 17 to Miss Margaret C. Fisher.

Western Union Lake Division.

THE INFLUENZA EPEDEMIC prevailing throughout the country generally has made serious inroads especially in the staffs of the smaller offices in Ohio. At one time fourteen managers were laid up on account of influenza.

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GEORGE F. SICKINGER, late night chief operator at Milwaukee, Wis., has returned to duty after three months' absence on account of illness.

THE MILWAUKEE LOCAL, ASSOCIATION OF WESTERN UNION EMPLOYEES, gave an entertainment on March 2, to which all employees were invited. The affair was of a social nature.

KENNETH S. BROWN, during the past five years in Western Union service as operator at Toledo, Ohio, died in that city on February 17. During the late war he was in the military service in France.

W. W. MACPHERSON, formerly manager at Kenton, Ohio, died of influenza on February 17. He started in the service as messenger boy eight years ago.

E. W. GROB, district commercial agent, has been appointed city superintendent at Columbus, Ohio. He is succeeded as district commercial agent by E. C. Bowen.

W. M. FRYER, formerly manager at Evansville, Ind., has been attached to Superintendent E. Boenig's staff as district commercial manager, with headquarters at South Bend, Ind., vice R. E. Eckler, resigned.

THOMAS SCHULL, operator at Logansport, Ind., died of pneumonia on February 17.

L. F. LIPPS, has been appointed manager of the office at Connersville, Ind.

W. F. LYNCH, has been appointed manager of the office at East Chicago, Ind.

RUBY M. BARROWS, has been appointed manager at North Vernon, Ind., and Miss M. Gregory manager at Clinton, Ind.

P. L. MOUNCE has been transferred to Evansville, Ind., as manager. Mr. Mounce had been acting as city superintendent at Indianapolis, Ind.

A. A. BROWN, formerly manager of the main office at Columbus, Ohio, has been appointed manager at Indianapolis, Ind., succeeding P. L. Mounce.

MISS EMMA MARTIN, formerly manager at Tiffin, Ohio, where she had been employed continuously during the past thirty-five years, died of influenza on February 10. Miss Martin was one of the most widely known and popular Western Union managers in the state of Ohio.

W. A. CONSTANTINE, Morse operator in the Cincinnati, Ohio, office of the Western Union Telegraph Company, within a period of six months handled 102,000 telegrams while working the Cincinnati-Charleston duplex. During this period his work was so accurate that no errors were charged against him.

Western Union Southern Division.

BEGINNING the first of this year the districts of the Southern Division were given new boundaries. The fifth district, embracing the States of Alabama and Mississippi under Superintendent Wilson, Meridian, Miss., and the sixth district, embracing the States of North and South Carolina, under Superintendent Carroll, Charlotte, N. C., were consolidated with other districts and the offices of these two superintendents discontinued. The offices in Mississippi have been placed in the fourth district, under Superintendent Cheatham at Nashville, Tenn. Alabama has been placed in the second district under Superintendent Ragsdale at Atlanta, Ga. North and South Carolina offices have been placed in the first district under Superentendent Sale at Richmond, Va.

C. H. CARROLL, formerly superintendent at Charlotte, N. C., has been appointed city superintendent at Atlanta, Ga. Former superintendent Wilson is now in charge of commercial development work, with headquarters at Nashville, Tenn.

S. L. BURTS, superintendent of traffic at Atlanta, had the misfortune to lose by death his father, which occurred at Honeapath, S. C., on February 15.

Star Morse Operator Heads Association Local.

Walter E. Flynn, twenty-nine years of age, and one of the most expert Morse telegraphers in Western Union service has been elected president of Local No. 51, Association of Western Union Employees, at Cincinnati, Ohio, vice Thomas E. Ragsdale, resigned.

Mr. Flynn holds the enviable record of having handled 816 telegrams in eight hours, an average of 102 equated messages per hour. Also, he has a record of sixty-six telegrams per hour over a period of six months.

The Cincinnati Local is one of the strongest and most influential units of the employees' association. It now has 700 members.

Conference at Ogden, Utah.

WESTERN UNION managers of the Mountain Division, Western Union Telegraph Company, were called together in conference at Ogden, Utah, on February 23. In addition to the office managers who attended the meeting the following officials were present: A. B. Cowan, division general manager; R. Vantine, division auditor; S. Ince, commercial manager, all of Denver, Colo., and U. G. Life, district commercial superintendent, Salt Lake City. After the business meeting a banquet was served at the Reed Hotel. Manager W. J. Dermody, of Ogden, made the arrangements for the banquet.

HAVE you secured one of the new 1920 carmine Government Savings Stamps? If you have not, get one this month. They advance in price April 1st. Save for a Government Savings Stamp.

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Defaulter Sentenced.

BERTHA MCCARRON, ex-manager for the Western Union Telegraph Company at Yale, Okla., recently made an attempt to embezzle money by means of a fraudulent money transfer telegram. Disaster followed immediately for Miss McCarron. She was indicted by a Grand Jury, and, pleading guilty, was sentenced to four months in a county jail, and to pay a fine of $3,000.

Messenger Boy Injured, First Thinks of Errand.

KENNETH MCKENZIE, fourteen-year-old Western Union messenger boy, employed in the Spokane, Washn., office, recently was sent out to deliver a package. He was mounted on a bicycle, and although a careful rider, had the misfortune to collide with a rapidly moving auto-truck, resulting in his being severely injured. When the boy was picked up and carried to the curb his first concern was for the package which had been given him to deliver, and before giving thought to his injuries, he asked if someone would please deliver the package. Boys of this type are the hope of the future.

"The Night Operator."

Telegraphers who enjoyed reading "The Wire Devils" will welcome this new book by Frank L. Packard. The book contains a number of short stories written about the alluring game of railroading; the first story, "The Night Operator", is also the title of the book.

In "The Night Operator" you will follow with spell-bound interest a panorama of rushing mountain rivers and dangerous curves, of brave men responsible for the safety of others, who meet their obligation with high hearts and abounding courage.

And when the book is read you will recall with delight "Toodles," the spunky little night operator, "Royal Carlton," the big superintendent, "Regan," the purposeful master mechanic, and "Timmy O'Toole," the valorous Irishman, and say to yourself, "Packard has done it again; written another breathless adventure story; I hope he goes on writing them."

The price of the book is $1.50 net. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

"The Sword and the Soul."

The above is the title of a new book by Col. W. R. Plum, the veteran telegrapher of civil war fame. The story deals with the adventures during the war of a Union telegrapher who had many hairbreadth escapes, and who performed many ingenious exploits in erecting and maintaining telegraph lines for the use of the Federal military forces.

The story is cleverly written; the plot is absorbing; the book is well illustrated and beautifully bound. $2.00 per copy from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

CANADIAN NOTES.

C. STEWART, traffic supervisor, Great North Western Telegraph Company, Toronto, has returned from a trip which took him to a number of offices in the interest of the service.

A CONFERENCE of traffic officials of the Great North Western Telegraph Company will be held in Toronto on April 2.

C. W. DAWZY, formerly chief commercial inspector, Great North Western Telegraph Company has been appointed manager at Toronto, vice C. E. Lillie, resigned.

THE OTTAWA office of the Great North Western Telegraph Company was completely rebuilt and equipped with up to date apparatus during the year 1919. Improvements are now being made in the Hamilton, Ont., office. The new operating department will occupy enlarged space on the second floor. A new power plant will be installed; also a ticker plant and a concentrator unit. A printer automatic circuit will be equipped for working with Toronto.

ADDITIONAL automatics will be installed in the offices at Toronto Montreal and Winnipeg during the present year.

EMPLOYEES from the main and branches of the Great North Western Telegraph Company, Toronto, held a masquerade and euchre at the Grotto Cafe on January 20. Dorothy Barber of the district superintendent's office and C. V. Smith of the Riverdale branch office took first prizes for the most unique costumes. E. Tennyson, of the general office, and Miss Norton won the euchre prizes.

BELL TELEPHONE COMPANY OF CANADA.

The annual report for 1919 of the Bell Telephone Company of Canada shows that during the year 4,835 miles of wire line were added to the company's plant. The long distance lines of the company now amount to 9,514 miles of pole lines, and 7,047 miles of wire in underground and submarine cables.

The number of company stations in service on December 31, 1919, was 337,476, an increase of 34,271 for the year. In addition there were 106,231 connecting and miscellaneous stations. The total miles of wire was 964,098; the number of central offices operated, 421, and the number of employees, 11,443. The number of subscriber stations was 337,476. In underground plant the company has 608 miles of conduit, 2,309 miles of single duct, 1,059 miles of cable, and 588,000 miles of wire.

Since the year 1886 the company has paid regularly a dividend at the rate of eight per cent per annum.

Glyn Osler, of Toronto, Ont., has been appointed a director in place of Z. A. Lash, deceased; and George D. Milne, of New York, a director in place of N. C. Kingsbury, deceased.

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POSTAL TELEGRAPH-CABLE COMPANY.

J. P. O'DONOHUE, assistant chief engineer, is visiting Atlanta, Ga., Knoxville, Tenn., and other southern cities in the interests of the service.

E. P. TULLY, assistant general manager, is in the south visiting the larger offices.

C. E. BAGLEY, superintendent at Philadelphia, Pa., was a New York business visitor on March 10.

THE COMPANY is arranging for the extension of its facilities at Cleveland, Ohio, due to the continued increase in the volume of business handled at that point. It is planned to equip additional space to care for the telephone and clerical departments.

C. C. RAMSEY, manager at Portland, Me., has resigned from the service to become manager of the Portland office of Hornblower and Weeks, brokers. Mr. Ramsay has been manager of the Postal's office in Portland continuously during the past eighteen years.

MANAGERS APPOINTED: G. V. Mitchell, Greenville, Miss.; N. La Fave, Amsterdam, N. Y.; L. A. Turner, Shelbyville, Ky.; C. V. Glover, Buchanan, Mich.; Miss G. E. Shaw, St Augustine, Fla.; P. W. Hutchins, Milledgeville, Ga.; Irene Cook, Council Bluffs, Ia; R. H. Mayer, Bangor, Me.; R. O. Du Rall, Ionia, Mich.

New York Postal.

A. F. KAVANAUGH, chief clerk, operating department; A. P. Kranshaar, quadruplex chief, and Miss N. Darcy of the service department have returned to duty after absences due to illness.

E. J. RANKIN, night manager, main office, has been confined to his home the past few weeks on account of illness, but is now recovering satisfactorily. During his absence James P. Williams, assistant night manager, has had charge of the office.

W. J. WHITE, night traffic chief, reports the arrival of a son.

WORD has been received of the death recently of J. J. Astegher, formerly traffic chief in the main office.

ALICE DUNN, supervisor of the telephone department, is absent on account of illness.

WALTER B. SCHREIBER, manager of the office at 20 West 45th St., New York, has been commissioned a first lieutenant, Signal Corps, by Governor Smith and has been assigned to Company A, First Battalion, N. Y. N. G. Lieutenant Schreiber has seen a considerable amount of active service and his long experience as a telegraph man has been of value in his Signal Corps activities. He has been particularly successful in attracting to Signal Corps work, telegraphers who are ambitious to make progress.

RONALD S. WISHART, for several years in charge of the Morkrum automatic equipment in the main office of the Postal Telegraph-Cable Company, New York, and later in charge of the automatic circuits of the Associated Press, New York, is now located in Paris, in telegraph work.

Buffalo, N. Y., Postal.

W. J. COLLINS who has handled the Buffalo-Toronto local wire for several years has resigned from the service to enter other business.

HARRY BAILEY, who formerly worked the Buffalo-New York first bonus circuit, has returned to Buffalo, after nearly two years with the overseas forces in the radio corps.

MRS. BILL, who has operated the Auburn Local wire during the past two years, has been promoted to the managership of a branch office in Buffalo.

A. G. BURGER, operating the Buffalo-New York first bonus circuit handled 12,034 telegrams in 192 hours, during the month of February. His average was sixty-two telegrams per hour.

R. M. LASHOMB has been appointed manager of the State Street branch office at Rochester, N. Y., vice A. M. Sherk, resigned.

Postal, Western Division.

E. W. COLLINS, general superintendant, has returned from a two weeks' vacation spent in the south, where he went to recuperate from a slight attack of influenza.

C. M. BAKER, general superintendent of plant, Chicago, is again at his desk after a short absence on account of illness.

C. A. COMSTOCK, assistant to the general manager, New York, recently visited offices at Toledo, Ohio, and Cleveland, Ohio, accompanied by W. L. Simpson, division electrical engineer, Chicago.

Book for Telegraphers.

"Twentieth Century Manual of Railway, Commercial and Wireless Telegraphy," by F. L. Meyer, is the title of a practical book for railroad telegraph men and dispatchers. Every branch of the railroad service has been covered in a practical and masterly manner, and the information given is the result of wide observation and experience. This book is a complete education in railroad telegraphy, from first principles to the finished operator, who can be relied upon to do things in emergencies. It has a chapter on wireless telegraphy. Price $1.25. For sale by TELEGRAPH AND TELEPHONE AGE, J. B. Taltavall, Publisher, 253 Broadway, New York.

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First Principles of Electricity.

The above is the title of a new book by J. E. Homans, which contains 248 pages of up to date matter relating to elementary electricity and magnetism. In addition to revised matter covering elementary principles the book includes detailed descriptions of electric wiring, alternating currents, polyphase wiring, motors and generators, armature and field windings, synchronous motors, rotary converters, transformers, etc.

Students who have only an elementary knowledge of arithmetic will have no difficulty masterng the subjects covered in this useful work.

The price is $1.25 per copy, and it may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THE J-C REPEATER, manufactured by the Jester-Cooper Company, Houston, Texas, requires no local battery in its operation. It is of the simplest construction, thus requiring the simplest adjustment. The object of this repeater is maximum efficiency with a minimum of maintenance. Those who are interested in this make of repeater should send for descriptive literature.

VACUUM TUBES IN WIRELESS COMMUNICATION. By E. E. Bucher. Pages (6x9 inches) 174; illustrated. New York, August, 1918.

Mr. Bucher, who is instructing engineer, Marconi Wireless Telegraph Company of America, in the present work presents a volume which shows over one hundred different circuits for the practical use of vacuum tubes as detectors, radio or audio frequency amplifiers, regenerative receivers, beat receivers and generators of radio frequency currents.

A series of graphic charts in the appendix explains the functioning of the vacuum tube in an elementary manner. The technical introduction reviews the problems of continuous and discontinuous wave transmitters and receivers.

The book is ably written and the illustrations are clear and understandable. Telegraph students and engineers will find written in its pages a great amount of radio information along lines that are certain to be of importance in the operation of radio systems of the present as well as the future.

The price of this book is $1.75 and copies may be obtained by making remittances payable to John B. Taltavall, publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Radio Buzzer Sets.

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $3.50 for the set.

Book on Alternating Currents.

Arithmetic of Alternating Currents, is the name of a new book by E. H. Crapper. For those who are familiar with elementary mathematics, this book will be found valuable as it describes in a thorough manner periodic and alternating currents; generation of alternating electromotive forces; inductances; inductive circuits; capacity and condensers: resistance, inductance and capacity in parallel; static transformers; induction motors and transformation of currents.

The book contains 208 pages. Price $1.25. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Electrical Instrument Making for Amateurs.

The above is the title of a book by S. R. Bottone, now in its eighth edition, which was written for the amateur experimenter who desires to learn electrical engineering principles by making electrical devices with his own hands. There are 272 pages and ninety-six illustrations, and detailed descriptions are given of how to make condensers, Leyden jars, induction coils, electroscopes, Tesla coils, magneto armatures, thermopiles, elementary wireless telegraph apparatus and many other pieces of electrical apparatus. The instructions are so simple that only inexpensive tools are required in making the instruments described.

The book sells for $1.35, and copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Electrical Education.

A large proportion of the graduates of the large universities which give electrical courses, when they leave college, enter the laboratories of the large industrial companies, and government electrical bureaus.

In the managing, construction and installation departments of operating companies and manufacturing companies there is a growing demand for practical electricians; men qualified to take up the task of getting work done. Telegraph and telephone employees living in towns and cities throughout the country, and who desire to enter the broader fields of the electrical industries, have open to them the thoroughly practical scheme of coming to New York, securing day work or night work in their regular line, and then taking up during their hours off duty a course such as that conducted by the New York Electrical School.

"Keep your hand on your pocketbook" is a pretty good admonition when you are in a crowd and the lights go out; but it's a bad practice to keep your hand on your pocketbook too much at other times, if keeping your hand there makes you spend money that you ought to save. Government Saving Stamps are the best plastic for a leaky purse. Save for a Government Savings Stamp.

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The Efficiency of the Telegraph.

When a manufacturer installs a new outfit of electric motors in his shops the makers of the motors are able to show him that a certain "efficiency" may be expected from the machines. This may be eighty per cent. or ninety per cent., depending upon the design and size of the motors.

An investor may purchase stocks or bonds which will yield a profit of five per cent or six per cent. If the rate is five per cent. the investor receives in twenty years an amount of money equal to his original investment. Thus, neglecting proceeds from reinvestment of interest, his money doubles every twenty years.

When we consider what is possible from the investment of money in various enterprises, or what relation "outlay" bears to "income" in any commercial undertaking, it is interesting to make comparisons in connection with money invested in telegraph service; that is, money paid as tolls on telegrams.

If there is a telegraph receiving clerk in the country who has not at least once each week during his or her telegraph experience been urged—importuned, to speed the dispatch of a telegram, the prompt handling of which meant thousands of dollars to the sender, and delay to which meant a like loss in dollars, in the parlance of the times, we'll say that clerk is stationed in an office where business is dull. Although the charge for sending the telegram may be as much as sixty-seven cents, the sender rarely senses anything incongruous in a situation wherein he stands to win a thousand dollars by investing sixty-seven cents. Dictionary definition of the word "efficiency" insures to it continued usefulness, but efficiencies of several thousand per cent give the word unusual significance.

A telegrapher in a stock broker's office once estimated the number of telegrams sent by the broker while he was piling up a fortune. We do not remember the totals, but the telegrams were in the hundreds and the proceeds in thousands.

The big returns from money invested in telegraph service, however, are not peculiar to the brokerage business, or to business conducted in the large cities. There was an instance which occurred in the comparatively small city of Elizabethtown, Ky., on March 6, last, when a real estate man by telephone called the manager of the Western Union Telegraph Company at her home at 1 o'clock in the morning, asking the lady if she would come down to the telegraph office and send a telegram which involved a fifty thousand dollar deal.

Of course, having her employer's interests at heart, and having been well trained in rendering every service possible to the public, the manager went to her office and transacted the fifty thousand dollar deal. The manager's efficiency plus the efficiency of the telegraph transformed a paltry dollar or two into a very large sum of money—for the sender of the telegram.

The manager at Elizabethtown, Miss L. M. McCarthy, was rewarded for her personal efforts in the deal by earning the tolls on the telegram for the telegraph company, and by earning the good will of the real estate man who, later, patronized the office with some additional business.

Instances of this kind occur daily in all parts of the country, and it is just this sort of service to the public that distinguishes private operation from government operation of public service companies.

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TELEGRAPH AND TELEPHONE LINE CONSTRUCTION IN ALASKA

By E. R. McFarland, Superintendent.

THE announcement that a telephone has been installed in the roadhouse at the summit of the Alaska range at Broad Pass, and the rapidly closing gap between the lines of communication of the northern and southern divisions, means the ending of one of the most interesting features of the work undertaken by the Alaskan Engineering Commission. Pioneer telephone line construction on this project will be a thing of the past when the wires now approaching each other from the north and south are finally connected.

LINEMEN OF THE NORTH.

Snow shoes in place of spurs. Note the tripod line wire support in background.

FAR IN ADVANCE OF RAILROAD.

This class of construction, temporary in character, has been thrown ahead of the steel rails, providing engineering and construction forces telephonic communication months, in some cases years, in advance of the railroad. It is, of course, obviously impracticable to build a permanent and standard cross-arm line ahead of the clearing and blasting and grading necessary in making a bed for the railroad.

ENERGETIC MEN NECESSARY.

Building pioneer lines has from the first, demanded men of energy and resourcefulness. Unless a man knows how to take care of himself under the conditions, knows how to roll his blanket without the help of a valet, is able to miss a meal without becoming hysterical, can chop, snow-shoe, build fires, sleep on spruce boughs laid on the snow, cook a little, whether for dogs or humans, and with it all, maintain a cheerful disposition and due consideration for the other fellow, he is not permitted to remain in these crews.

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TELEPHONE MEN PACK HORSES.

Like locating engineers, telephone men accept such conditions as a part of the game; no one is blamed for the absence of mattresses, or comfortable buildings to live in, or many other things we have been in the habit of looking upon as necessities. The manner of doing the work even has of necessity been at times most primitive. Wire for the Indian-Ship Creek crossing was carried on pack horses, assisted voluntarily by a rancher in the vicinity. Some of it was carried miles on the backs of men. In the Matanuska Valley, later, wire was carried by the men as much as eight miles. When the Indian-Ship Creek connection was about to be made. the transportation problem was so serious that the men were literally without grub.

BILL OF FARE NOT INVITING.

A couple of Alaskan Engineering Commission officials stopped for lunch with one of the crews on the day the wires were closed, and all the foreman could offer them was a can of salmon and a cake of tar soap. The then superintendent of construction personally opened his own can.

SITUATION DIFFICULT TO REALIZE.

When, in a very few years from now, people are riding comfortably across Broad Pass in a few hours, grumbling at an hour's delay, it will be hard to realize that in 1920, men were battling with poor trails or none at all, eating frozen sandwiches for lunch, sleeping in their clothes, hauling wire and other material and supplies for miles with dog teams—and carrying them on their backs.

FIRST WIRE CONNECTION TO ANCHORAGE.

The first wire connection to Anchorage from the coast at Seward was a pioneer line forming an extension of the old Alaska Northern Railroad wire which ended at Kern Creek, Mile 71 from Seward. It came to Anchorage over the Indian-Ship Creek summit. The circuit was composed of one wire, making what is known as a "grounded" line. Theoretically, it is impracticable to talk 100 miles on a grounded line, but the people of Cook Inlet appeared not to know this and the wire was so used, "grounded," although 126 miles long. It was composed of practically all known gauges and compositions of wire; there was copper wire of various sizes from Panama, a variety of iron including hay-baling wire, and once near Bird Creek a first-aid bandage of dog harness was found holding the wires together. It cannot be said that the service was very good in those old days, but it was at least a little better than nothing. Manufacturers of telephones insist that their instruments be placed on non-vibrating walls, protected from the weather, etc. Alaskan Engineering Commission telephones were then, and are still, at least on the "front," forced to do service fastened to tent frames, in box cars and cabooses, wired to trees and posts in rain and snow, batteries frozen, parts missing, hitched up grounded when they should be metallic, and vice versa.

SEEMING MONUMENTAL OBSTACLES OVERCOME.

Although the great interior of Alaska presents no greater difficulties in construction, maintenance and operation of telegraph and telephone facilities than does Montana or the Dakotas, those responsible for results believed, soon after the Seward-Anchorage temporary wire across the coast ranges was placed in service, that lines here were subject to more causes for grief than they would be anywhere else on earth. With the unexpected and excessive demand for service from the very first, there were snowslides and avalanches to contend with; high winds and falling trees; accumulations of sleet and snow; falling ice stalactites, and stalagmites swallowing the wire; glaciers and shifting glacier streams; forest fires, floods, growing underbrush causing low insulation, and worst of all, inaccessibility. Maintenance cost today, with from four to six wires connecting Seward and Anchorage on a standard six-pin cross-armed pole line paralleling the railroad, is barely 10 per cent of what it was in the early days when linemen were continually fighting to keep things going.

BUSY LINEMEN NOT AFFECTED BY CRITICISM.

Old-timers in the telegraph and telephone game know that the average railroad operating official is not interested in his problems until the service fails, then there is no doubt as to what is on his mind. The general public usually has something to say on the subject, also, but in 1915–16, the telegraph and telephone employees were too busy trying to eliminate "bugs" and "cross-talk" and providing freak circuits to be unduly affected by criticism.

NOT TO THE WIRE CHIEF'S LIKING.

Some of the circuit schemes harnessed up with improvised equipment those days are not approved by electrical handbooks. For instance, after a part of each end of the Seward-Anchorage line had been made "metallic", there were occasions when one telegraph message and four telephone conversations were passing over the wire simultaneously. Impossible, theoretically. It might be technically described as a composited-grounded-metallic-simplexed-overloaded circuit. There were phantoms, but not the kind a wire chief cares to deal with.

GOOD LUNGS CONDUCIVE TO GOOD SERVICE.

Patrons became so adept in cross-talking that it was no unusual matter to find two conversations being held on the same wire, each pair thinking the other fellows were being heard via induction. In many cases, the ones who talked loudest got the best service.

AMAZING GROWTH OF TELEGRAPH BUSINESS.

When the telegraph and telephone department was organized early in 1916, it was assumed that all wires would be reserved for the use of the Government only. This was soon found to be out of the question. Nearly one hundred passenger and freight boats anchored off Anchorage that summer, bringing thousands of people from the States.

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Telegraph business grew amazingly. Commercial as well as Government traffic filled the hooks in the temporary telegraph office established in a tiny room intended for a lavatory in the townsite building. A daily paper was started and immediately there was a daily run of several hundred words from the Associated Press. Money transfers, night letters and all kinds of "Morse" business were sandwiched between telephone messages almost before there was an opportunity to establish rates.

Rough and ready methods and improvised equipment soon gave way to something more modern. Extensions, improvements and availability of modern apparatus has now provided service as good as the best. Although wires within the townsites are on the same poles with electric light and power wires, talking circuits are noiseless. Long distance circuits of solid copper wire, properly transposed and insulated, compare favorably with those of similar and even greater length anywhere in the United States. From 71 miles of wire, the system has grown to nearly 2000 miles, exclusive of wire strung in the townsites and camps. There are 240 miles of permanent line, and about the same amount of temporary or pioneer line. This in spite of the fact that during the war, line construction was practically at a stand-still.

EVOLUTION OF THE SWITCHBOARD MARVELOUS.

From a home-made "switch-board" made of knife switches hammered out of copper sleeves and bits of wire mounted on a piece of board from a packing case for a base, and manipulated by a lineman in an effort to do away with a portion of a bewildering amount of code ringing, the telephone service has grown to six switchboards operated by skilled women operators who are handling approximately 60,000 local and long-distance calls each month, serving more than 500 telephones.

RADIO PLANT AND ELEVEN TELEGRAPH STATIONS IN OPERATION.

A radio plant enabled the commission to keep in touch with certain small craft necessary in earlier periods of the work, and has been found invaluable in making harbor arrangements for approaching steamers from the States, hours before their smoke could be seen on the horizon, while 11 telegraph offices are in operation, handling more than 5,000 messages monthly.

PLENTY OF "JUICE" FOR EVERYBODY.

The electric light and power service of the Alaskan Engineering Commission, with the exception of the operation of the generating plants, is being handled by the telegraph and telephone department. There are plants at Anchorage, Nenana, Eska and Chickaloon. The electric light and power branch of the department also had its trials in the early days, both at Anchorage and Nenana, when lack of transportation for adequate equipment and the excessive and insistent demand for current made a difficult problem. There is now plenty of "juice" for everybody. Interrupted service is rare, lights are steady and brilliant, and lamps and motors may be turned on at any hour.

UNIQUE AND UNUSUAL FEATURES.

Several unique and unusual conditions encountered in building telegraph and telephone lines in Alaska have developed unique and unusual features. All non-essentials have been eliminated. The tendency in the States to use shorter poles than formerly because of the growing shortage of timber has been found advisible here for the same and other reasons. The square or stump-top pole, now also in use in certain localities in the States, have engineering reasons for their adoption here, and the Engineering Commission has discarded the roofed pole as a bit of frivolousness comparable with the old brass mountings on railroad engines which are no longer seen. The old stereotyped "gain", has also been abolished for a number of reasons, so that lines have been built with a sturdy, substantial appearance which not only rhymes with the landscape and fits conditions, but gives a more mobile construction permitting of readier and more economical adaptation to the inevitabe changing and readjusting incident to the settling down of a new railroad.

THE TRIPOD LINE.

Another feature of Alaskan line construction, worked out a number of years ago by men at that time in the signal corps, but now in the telegraph and telephone department of the Commission and which has been included in the United States Army Signal Corps construction manual as standard under certain conditions, is the tripod line. This kind of construction has been used to a considerable extent in pioneer construction, though it may be necessary to use it on permanent lines in certain localities. Experiments made with cross-arms fastened to the tripods have not proved satisfactory. It is more adapted to light bracketed lines carrying but few wires, and can be built for what it costs to dig the holes alone in frozen ground. It can also be built in winter when there is not too much snow, an advantage in swamps, when it is impracticable to build an ordinary pole line.

One of the first things an engineer coming to the north learns, is that a pole or post or piling simply will not stay in the ground where the subsoil freezes. Attempts have been made to sink poles deep into permanently frozen ground with a view to their freezing fast. The results are the same. The wood conducts enough heat during the summer to form a pocket of water around the butt of the pole, winter comes on, up it comes a little the first spring, more the next spring, and so on until finally there is no support.

WELL EQUIPPED TO SERVE THEIR COUNTRY.

Twenty-five per cent of the men whose names were on the telegraph and telephone pay-roll in April, 1917, entered the service during the war. Seventy-five per cent of those saw foreign service. Fifty per cent of those on the rolls today were in Alaska before railroad construction began. The other 50 per cent also have the pioneer spirit which has made the United States what it is today.

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WESTERN UNION TELEGRAPH COMPANY MOVES INTO NEW OFFICE AT KANSAS CITY, MO.

At midnight, January 31, the Western Union Telegraph Company at Kansas City, Mo., moved from its old location to a modern four-story building at Seventh and Walnut Streets. This building is approximately 90 feet by 137 feet, furnishing a working floor space of approximately 10,000 square feet per floor. Its heating plant is operated with fuel oil fed from an underground 11,000 gallon tank. As three sides of the building are exposed, excellent lighting is obtained on all floors. This lighting is further augmented on the three upper floors by a light court extending half the length of the fourth side.

WESTERN UNION NEW BUILDING AT KANSAS CITY, MO.

The fourth or top floor is occupied entirely by the main operating department. On the third floor are located the testing and regulating department and various clerical offices. The telephone department occupies the southwest corner of the second floor. The remainder of this floor is taken up by women's locker and rest room, men's locker and rest room and employees' restaurant. The ground floor is given over to the commercial office and messengers' quarters. The basement houses the heating, emergency power and air compressor plants. Storage space is also provided here.

The testing and regulating department is located in the northwest corner of the third floor. The switchboard is made up of seven sections of main board, two sections of city line board and one loop board. By proper manipulation of this switchboard the traffic dispatcher can handle business with a minimum delay under constantly changing wire conditions. Two hundred and twenty-six main line wires, 27 city wires, 130 single loops and 23

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duplex loops are carried to the switchboard. Kansas City is also an important repeater station, 44 repeaters of various types being located in the testing and regulating room. The power plant necessary to handle the business of this office consists of three 1 horsepower and six 1½ horsepower motor generator sets in which the central station voltage of 110 volts is boosted by the generator to 160, 240 and 320 volts. A 40 K. W. kerosene engine-driven generator carries the power and lighting load in case of failure of the central station service. This engine is fed from an underground 480 gallon tank.

The main operating room occupies almost the entire fourth floor. The multiplex department, consisting of 58 channels, occupies the north side of the floor; the Morse department consisting of 160 operating positions occupies the south side of the floor. An average of sixty thousand messages is received and transmitted by this office each day. In the busiest hour six thousand messages are handled. The bulk of the business is handled by the multiplex department, a four channel multiplex set being capable of handling 600 messages an hour over one main line wire.

A message relayed via Kansas City office is placed before the outgoing operator for transmission within an average of 90 seconds after it is received by another operator. The routing of messages within the office is accomplished by means of a specially designed belt conveyor system. These conveyors run in the center of the long operating tables on each side of which are a dozen or more operators. As soon as the message is received the operator places the typewritten copy on the conveyor. The table conveyors discharge into a pick-up conveyor running at right angles to them and toward the southwest corner of the room where the distributing center is located. Clerks at the distributing center place the message on one of six delivery conveyors which carries it to a drop located nearest the outgoing wire. A check girl carries the message from the drop to the outgoing operator. Messages sent in from the larger branch offices within a radius of a half mile of the main office are sent into the distributing center by a pneumatic tube system. Deliveries to these offices are made in the same manner. There are six such offices in Kansas City. The compressed air is furnished by a 35 h. p. Worthington-Laidlaw Feather Valve compressor. An identical compressor is used for relief and emergency purposes.

The telephone department located in the southwest corner of the second floor is an important adjunct to the main operating room. Here messages are received and sent by telephone from and to private telephones and outlying branch offices. It is connected to the distributing center by a riser belt and a gravity drop chute.

The commercial news and time service departments are small but very important parts of the main traffic department. The tickers handle Kansas City grain, New York grain, New York stock quotations and baseball reports. The New York stocks are worked on a self-winding ticker. This type is the fastest known, printing 250 characters a minute. The other tickers are Universal type. By using relays the St. Joseph, Mo., grain ticker is worked a long distance from Kansas City office, using the same apparatus. The time service department keeps the correct time on over 1500 clocks scattered throughout the city.

The commercial office is located on the ground floor at the street corner. It is connected to the distributing center by the pneumatic tube system. The rear of the ground floor is given over to the messengers. Here is located the messengers' waiting room to which access is obtained by a separate side entrance. A tailor shop furnishes, presses and repairs the boys' uniforms. The boys are also provided with a club room and showers.

Provision has also been made to better the social life of the employees during working hours. Almost the entire second floor is given over to the employees. The men's locker and rest room occupies 3000 square feet of floor space and the women's locker and rest room 3600 square feet. The women's rest room is fitted up on a par with the women's rooms found in the larger city department stores. In addition a piano and victrola are provided. A restaurant capable of seating 125, in which meals are served to employees at cost, adjoins the rest rooms.

For the training of future operators a multiplex school and a Morse school are provided in which prospective operators are given a thorough training.

The remainder of the building is occupied by the clerical forces of the district commercial department, relay control bureau and district traffic department. In the relay control bureau copies of messages are kept on hand for reference for nine months.

Kansas City office, in keeping with the policy of the central office, engineering department, in New York City, is the latest word in telegraph offices. Every feature known to that department up to the day of cutover has been incorporated in the new office. The Western Union has a twenty-five year lease on the building which was designed to provide for all future needs of the company within that time.

EMPLOYEES of the American Telephone and Telegraph Company have subscribed for 42,131 shares of the company's stock. By July, 1922, when the shares are fully paid for, the employees will have saved in this way alone $4,213,100, and will be receiving annually a total of $337,048 in dividends.

J. S. MCCULLOH, until December, 1919, general commercial agent of the New York Telehone Company, and who at that time was appointed vice-president in charge of publicity and commercial work, from 1885 until 1893 was in the telegraph service of the West Shore Railroad and the Western Union Telegraph Company.

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SUBMARINE CABLES

JAMES R. BEARD, vice-president of the Central and South American Telegraph Company, New York, has returned from a business trip to South American countries, where he has been since October 1919. He reports having had a pleasant and a profitable trip. He was accompanied by Mrs. Beard.

THE COMMERCIAL CABLE COMPANY has removed its branch office heretofore, and for many years, in the New York *Herald* building, to No. 4 West 37th Street, near Fifth Avenue.

THE COMMERCIAL CABLE COMPANY has issued a new booklet, dated March, 1920, which gives present cable rates to all countries of the world from New York. The booklet includes a list of rules and regulations governing the handling of cablegrams, and a revised list of examples of word counting, and a list of the business holidays in Europe and America.

CLOCKS in Great Britain were advanced one hour beginning 2 a. m., March 28. The change will continue until September 27.

All America Cables, Inc.

On March 10, the New York Stock Exchange passed favorably on the listing of the stock of the All America Cables, Inc., with $22,991,400 of capital stock in exchange for present stock of the Central and South America Telegraph Company.

Cable Staff Changes.

PACIFIC CABLE BOARD: W. E. Lawson, Bamfield to Sydney; R. A. Bullock and F. N. Bunny, Southport to Sydney; G. A. Keys, Norfolk Island to Melbourne; F. W. Heaps, Auckland to Norfolk Island; I. J. Keneally, Norfolk Island to Southport; J. Letters, Fanning Island to Southport; B. W. Black and T. B. Bailey Fanning Island to Auckland; T. Atkins and J. Reitz, Suva to Halifax; H. J. Hutchinson, Sydney to Auckland, and F. C. Wilkins, Montreal to Halifax.

WEST COAST OF AMERICA TELEGRAPH COMPANY: P. A. Oliver, W. T. Gibson, N. R. J. Tizard and W. J. S. Murrin, from England to Buenos Aires; J. Mc A. Campbell, J. B. Rymer, G. N. Butcher, C. F. Pullen, P. B. Howie, E. W. Cairns, A. Chennell, J. F. Errington, G. T. Doyle and C. H. Dudeney from England to Madeira; F. G. Hammonds, W. J. Stratton, J. N. R. Rutter, E. H. Wallers, C. N. Webber and J. A. Murray from Madeira to Montevideo.

Captain De Carteret of the "Lord Kelvin" Receives Loving Cup.

Upon his retirement recently from the commnd of Western Union cableship *Lord Kelvin*, Captain W. G. S. De Carteret was presented at Halifax, Nova Scotia, with a loving cup and an illuminated address from the officers and men in the service with whom he has long been associated.

The cup is a magnificent specimen of the art of the silversmith. It is nineteen inches high and twelve inches in diameter, supported by a graceful silver stem mounted on a wood base. The inscription on the cup reads:

> Presented to Captain W. G. S. De Carteret as a token of the good-will and esteem of the officers and men of the cableship *Lord Kelvin* on the occasion of his retirement from command of the ship.

The words of the accompanying address are appropriately framed and are surrounded by a chain of gold. At each corner is represented a patent grapnel used in searching for cable lines on the bottom of the ocean. In the center at the foot is a ship's steering wheel, and at the top center appears the Western Union badge backed by a Union Jack and Ensign.

Direct United States Cable Company, Ltd., vs. Western Union Telegraph Company.

In the litigation now under way in the chancery division of the English courts the hearing adjourned in November last was continued on February 16. The postponement was for the purpose of procuring evidence and documents from the United States, concerning the dispute between the two companies in relation to a 99 years' lease of a trans-Atlantic cable at an annual rental of about £60,000. The plaintiffs (an English company) under the covenants of the lease of their cables to the defendant company undertook to repair the lines and maintain through communication, power being reserved to the lessees to determine in the event of 18 months' continuous interruption.

Mr. Mangham, K.C. (for the defendant company), on the hearing being resumed, said that he proposed to take the evidence from America as to the break in the cable in shallow water in America as he understood that some point was going to be made of the new repairs of the shallow water section of the cable on the United States side. He proposed to produce evidence as to breaks which had occurred between Rye Reach and Halifax, but inconvenience and complications arose from the fact that he did not know what was the real issue between the parties.

Mr. Romer, K.C. for the plaintiffs, said that his contention was that the plaintiffs were estopped from relying upon the smaller breaks in the cable. He complained that the other side had failed to make

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repairs which his company were led to believe they would do. It was not until after the action had been started that they became aware of the fact that certain breaks had not been repaired.

Mr. Patrick William Reib, superintendent in charge of the station at Rye Beach, New Hampshire, was called, and in his examination by Mr. Mangham said that in the course of his duties he became aware of the loss of insulation in the Halifax cable due to breaks or faults. One of the breaks complained of, he said, occurred about 428 nautical miles from Rye Beach on January 7, 1917, and another occurred on August 8, 1917, close to Halifax. These were both repaired shortly afterwards. On December 2 of that year there was an interruption, which was repaired on the 11th and communication was re-established. As to the first fault, they were able to work through, but with great difficulty, but on January 7, 1918, there was complete interruption, and he localized it at about 325 nautical miles from Rye Beach. Then on the 9th another break occurred 93 miles from Rye Beach, and from that date to July 29, 1919, the cable could not be used. Between January 5, 1918, and July 29, 1919, it was not possible to use the cable between Halifax and Rye Beach.

Witness then gave details of the repairs carried out from time to time by the company's ship.

In cross-examination, witness said as to the breaks in the Bay Robert section the repairs were carried out by a French cable ship, but with that exception they were always repaired by his company's ships. The French ship, while repairing other cables, broke the defendant's cable by mistake and repaired it. The breaks in the shallow water cables were frequently caused by dredgers and other ships fouling them. A great many breaks in Halifax harbor had occurred from this cause.

Mr. Joseph Brown superintendent in charge of the Halifax cable station, also gave evidence as to the condition of the cables between Rye Beach and Halifax, and Halifax and Bay Robert and the breaks spoken of by the previous witness, as well as to the time occupied in carrying out the repairs.

Mr. Carlton, president of the Western Union Telegraph Co., of New York, gave evidence as to the general organization of the Western Union Company. He said that the superintendent reported directly to him, and among the most important matters reported to him were the repairs of cables, the expenditure in relation to which was very heavy. There were three repairing ships leased to the company.

After describing the company's system of cables and the details of the repairs done by the ships in the control of the company, the witness said that there were seven breaks in 18 months, the whole of which were repaired by two of the company's ships. During 1918 they had no ship to repair the Halifax-Rye Beach section without sacrificing other much more important work.

The cross-examination of the witness by Mr. Patrick Hastings, K.C., was directed to showing that the Western Union were desirous of leaving an interruption to continue for 18 months so that they might be in a position to put an end to the contract.

The hearing was adjourned.

On the case being resumed, on February 17, further evidence from America relating to breaks and the action of the defendants in relation to the repairs was given.

OWNERSHIP STATEMENT.

Statement of the ownership, management, circulation, etc., required by the Act of Congress, of August 24, 1912, of TELEGRAPH AND TELEPHONE AGE, published 1st and 16th days of each month at New York, N. Y., for April 1, 1920.

State of New York, } ss.:
County of New York, }

Before me, a notary public in and for the State and county aforesaid, personally appeared John B. Taltavall, who, having been duly sworn according to law, deposes and says that he is owner of TELEGRAPH AND TELEPHONE AGE and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, John B. Taltavall, 253 Broadway, New York.
Editor, Donald McNicol, 253 Broadway, New York.
Managing Editor, none.
Business Managers, none.

2. That the owner is:

John B. Taltavall, 253 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are:

None.

4 That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

JOHN B. TALTAVALL,
Publisher.

Sworn to and subscribed before me this 18th day of March, 1920.

[SEAL] JOSEPH R. FRITH,
Notary Public Kings County No. 50.

Certificate filed in New York County No. 122.
Kings County Register's No. 148.
New York County Register's No. 10113.
Commission expires March 30, 1920.

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Radio Telegraphy

Radio Corporation of America Notes.

C. J. Ross, comptroller, is en route to the Pacific coast on business of the company.

GEORGE S. DE SOUSA, treasurer, and Mrs. De Sousa are receiving congratulations on the birth of a son.

THOMAS J. HAYDEN, has been appointed engineer in charge of Tuckerton, N. J., station.

AT THE CHATHAM, MASS., high power station John Cowden and William Moore have been appointed supervisors. Kenneth McAlpine has been added to the operating force, and E. B. Dallin to the engineering staff.

AT MARSHALL, CALIF., C. L. Cronkhite and E. H. Martinelli have been added to the operating force. F. M. Roy has been appointed acting chief engineer.

AT BOLINAS, CALIF., W. H. Graff is engineer in charge; E. S. Howard, senior shift engineer; E. R. Riddle and C. Bailey, shift engineers.

J. W. HARTE is chief operator of the Philadelphia, Pa., office.

WILLIAM I. MCGHEE, of the British Marconi Company, who has been stationed in New York for a year past, has returned to England.

LINN C. EVERETT, engineer, is stationed at the New Brunswick, N. J., station.

A. VAN DYCK, engineer, is stationed at Tuckerton, N. J.

IRL C. REID has been appointed receiving expert and is stationed at Belmar, N. J.

HAROLD L. OLESEN, receiving expert, has been transferred to the Lujan, Argentina, receiving station.

THE TUCKERTON, N. J., station is being equipped with a 50-K. W. Alexanderson alternator. The station will probably be used for communication with France.

THE MARION, MASS., station is being equipped with a multiple tuned antenna similar to the one in use at New Brunswick, N. J.

E. M. HARTLEY has been appointed district manager at Philadelphia, Pa., vice Lee Manley transferred to New York.

LEWIS E. RICHWEIN has been appointed inspector in the Southern Division, with office at Norfolk, Va.

HAROLD C. ELY has been appointed district manager at Galveston, Tex., vice Charles H. Acree, resigned.

F. D. HEISER, night southern traffic chief, main office Postal Telegraph-Cable Company, New York, has joined the operating staff of this company.

L. C. F. HORLE, expert radio aid, Navy Yard, Washington, D. C., read a paper entitled "Navy Receiving Equipment," at the March 26 meeting of the Radio Club of America, held in the engineering building, Columbia University. The paper dealt with the design, construction and theory of modern radio receiving equipment. The paper was supported by demonstrations of recent types of apparatus.

IN FORMOSA a new radio station is to be opened for service in the near future for the use of the Japanese navy. It is reported that another station for the same purpose is to be erected near Lin-shu-tun, Manchuria.

A HIGH POWER RADIO STATION is to be erected at Croix d'Hinge, near Bordeaux, France, with transmitting equipment five times more powerful than than at Eiffel Tower station.

New Radio Company.

The Continental Radio Telephone and Telegraph Company has been organized at Dallas, Tex., with the object of supplying communication between Dallas, the oil fields, and the principal cities of Texas, Oklahoma, Arkansas, New Mexico and Louisiana.

The company has a capital stock of $20.000. W. R. Field, is president, W. J. Chilton, vice-president and general manager, and L. C. Field, secretary-treasurer of the company.

It is stated that the construction of the Dallas station has already been begun.

Wireless Telephony.

Successful wireless telephonic tests have been carried out between Madrid, Spain, and Chelmsford, England, and conversation was carried on without appreciable difficulty.

An attempt is shortly to be made to speak from Chelmsford to America and Australia by wireless telephony.

On February 29, for the first time intelligible wireless telephonic messages were received at the Waxholm wireless station, 12 miles from Stockholm, from England and Germany. The English message was distinctly audible.

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Wireless telephonic messages are transmitted every evening from Chelmsford, at 8 p. m., for experimental purposes, and it is reported that such a message has been picked up by a ship at sea, 600 miles away, with an ordinary commercial receiver.

Marconi Wireless Stations in Mongolia.

It is reported that the Marconi Company is making arrangements with the Chinese government to establish high-power stations in Peking, Urga Urumchi, and Kashgar, which will be able to communicate day and night with the India government station of Simla. There also are to be subsidiary stations in Uliassutai, Kobda, Sianfu, and Hami. It seems evident that well-informed people feel that these trade routes are of very great importance. If a railway is to be constructed from Kagan through Urga to connect with the trans-Siberian, and the old routes to India are to be reopened, the situation in eastern Asia will be materially affected.

Communication Resumed Between Kovno and Vilna.

A special joint Lithuanian-Polish committee has just successfully terminated its work in establishing preliminary resumption of railway, telegraph, and telephone commmnuications between Kovno and Vilna. The general terms of the agreement are as follows:

Telegraphic communication is to be established between Vilna and Kovno, English, French, Polish, Lithuanian, and German, are admitted, but no ciphers.

A railway telegraph and telephone is to be established on the railway line connecting the end station with Jewie, to be used only for service messages. No private telephone conversations will be permitted (Polish ruling).

All purely technical matters with regard to postal, telegraphic, and telephonic communications are to be settled by subcommittee.

The New National Electrical Code Rules and the Radio Amateur's Station.

Rule No. 86, of the National Electrical Code, which, heretofore has governed the installation of radio telegraph apparatus in shore stations, has been understood to cover approved methods of installing apparatus in amateur radio telegraph and telephone stations.

In the present rules there is nothing to show whether or not the rules are intended to apply to both sending and receiving aerial structures. Also, it was thought that the six-inch spacing required between wall and aerial lead is justified only when high voltage spark sets are used. These, and various other provisions of the rules obviously required clearing up if the large number of amateur stations now being fitted up are to be wired according to standard specifications.

Recognizing the need of expert opinion the National Fire Protection Association, a few weeks ago invited the cooperation of the Institute of Radio Engineers in framing new rules, and the Institute appointed a committee for this purpose.

The proposed revision of Rule 86, Radio Signaling Apparatus, as it appears in the 1918 Code, provides that the aerial conductor be maintained at a distance of five inches from the wall of the building, and that where the lead passes through the wall of the building it shall pass through a continuous insulating tube, or bushing, of such length that it will extend five inches from the outside and inside surfaces of the building wall.

It is required that aerial conductors must be effectively and permanently grounded when the station is not in operation, by a conductor, the periphery of the cross-section of which is not less than three-quarters of an inch, and must be of copper or other metal which will not corrode excessively under existing conditions. The actual ground contact should be made in accordance with the regular grounding rules of the Code (15A, sections O to T).

Inasmuch as it is recognized that a receiving station may at any time become a sending station, the rules are understood to cover both sending and receiving stations. A modification is made where, in simple receiving aerials, the grounding switch may be replaced by a short-gap, or vacuum type lightning arrester.

The proposed revisions suggest that the grounding switch shall have a blade with a periphery of not less than three-quarters of an inch, with a five-inch spacing between aerial and ground contacts. Switches with slate bases are not permitted.

When supply is obtained direct from street service the circuit must be installed in approved metal conduits or armored cable. In order to protect the supply system from high potential surges there must be provided two condensers (each of not less than one-half microfarad capacity and capable of withstanding 500 volts test) in series across the line with midpoint grounded. A fuse not larger than ten amperes capacity shall be connected between each condenser and the line wire connected thereto. Each condenser shall preferably be protected by a shunting fixed spark-gap of 1/32 inch separation, or less.

The Electrical Committee of the Fire Protection Association will very likely in the near future announce its action upon the proposed revisions.

Non-Battery Sounder.

The relay attachment manufactured by the Railways Labor-Saving Device Company, of Davenport, Iowa, which takes the place of the local battery sounder, continues to meet with favor in both railroad and commercial telegraph service. As a reading sounder the device is satisfactory, and the cost of local battery sounder is avoided.

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Canadian Telegraph Items

CHARLES R. HOSMER, director of the Canadian Pacific Railway Company, has been re-elected president of the Ritz-Carlton Hotel Company, Montreal, Que.

Canadian Pacific Railway Officials Hold Conference.

The annual conference and dinner of the officials of the Canadian Pacific Railway Company was held in Toronto, Ont., on March 13. Special trains brought the officials from Winnipeg, Man., and from Montreal, Que. About six hundred persons attended the banquet.

The telegraph department of the system was represented by: John McMillan, manager of telegraphs, Montreal; W. J. Camp, assistant manager of telegraphs, Montreal; William Marshall, assistant mananger of telegraphs, Winnipeg, Man.; superintendents, A. C. Fraser, St. John, N. B.; W. M. Thompson, Montreal; W. D. Neil, Toronto; D. H. Bowen, Sudbury, Ont.; E. M. Payne, Winnipeg, Man.; D. L. Howard, Calgary, Alb.; D. Coons, Moose Jaw, Sask.; R. N. Young, Vancouver, B. C.; and, J. Mitchell superintendent of traffic, Montreal; H. J. Lillie, chief operator, Toronto; W. Smith, assistant chief operator, Toronto; G. Paton, agent, Toronto; A. L. Marsden, special representative; J. Lahey, agent, Hamilton, Ont.; A. Malcolm, inspector, Montreal, Que.; E. A. Spear, and H. S. Ingram, inspectors, Toronto and P. G. Galbraith, inspector, London, Ont.

The telegraph representatives attending the conference left Toronto for Montreal on March 14, where a business meeting was held on the 15th.

A pleasing incident of the Montreal meeting was the presentation to W. J. Camp, assistant manager of telegraphs, of a handsome cane and an umbrella for himself and a specially selected umbrella for Mrs. Camp. Remarks complimentary to Mr. Camp's loyal, faithful and efficient service to the company were made by John McMillan and William Marshall.

Long Telegraph Circuit Across Canada.

What is probably the longest telegraph circuit in the world at the present time, is one leased by the Pacific Cable Board from the Canadian Pacific Railway. This extends from Halifax, N. S., to Bamfield, B. C., a distance of three thousand nine hundred and eight miles, and connecting the Imperial Atlantic Cable up with the Pacific Cable System to Australasia.

Duplex Wheatstone apparatus with keyboard perforators is used and the normal speed is 200 letters per minute in each direction. Normally, repeaters are located at Montreal, Sudbury, Fort William, Winnipeg, Calgary and Vancouver, but in bad weather, St. John, N. B., Ottawa, Ont., or Moose Jaw, Sask., may be called in for additional repeater service.

This circuit is worked daily for the full 24 hours, and it is only through prostrations of line on account of storms, etc., that it is stopped.

Messages are not written out at any point on the system between Australia and England. At the relay stations the received tape is gummed on blanks and re-transmitted from the tape. At London messages are received on perforated tape from which they are automatically typewritten and ready for delivery.

John C. Cooney, Canadian Telegraph Chief.

The death at Ottawa, Ont., on December 19, 1919, of John C. Cooney, removed from the telegraph field in Canada one of the most widely known and most popular telegraph chiefs of the Dominion.

Mr. Cooney was born at Ottawa sixty-seven years ago, fourteen years before that city became the capital of the Canadian Confederation. When a boy he started to learn the printing trade in the office of the Ottawa *Daily Citizen,* but before his apprenticeship was completed he met with an accident which deprived him of the use of his right arm, necessitating his taking up employment where the physical handicap would not be serious.

About that time the late N. W. Bethune, then superintendent of the old Montreal Telegraph Company, had his attention attracted to young Cooney, and the boy was given an opportunity to learn telegraphy. He made rapid progress, and at twenty years of age was placed in charge of the office at Deux Riviere on the upper Ottawa river, during the constuction of the Canadian Pacific Railroad. Becoming skilled as an operator, Mr. Cooney migrated to the western States and worked at various points on American railroads in Montana, Dakota, Texas, and Arkansas.

In the year 1886 the Canadian Pacific Railway Company opened a commercial telegraph office in Ottawa, the organization of the staff being placed in the hands of W. Y. Soper, previously local manager for the Dominion Telegraph Company, and at the present time one of the leading magnates of electrical industry in Canada.

Mr. Soper selected John Cooney for a place in the new office, calling him from Kansas City, Mo., for that purpose. As operators Mr. Soper also called upon several other Canadian telegraphers

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who were experts and who were employed in the United States. Among these were M. R. Grimes and J. A. Ahearn, employed in the New York office of the Western Union Telegraph Company, and Harry Bott, employed in press service at Buffalo, N. Y.

At the present time Mr. Bott is inspector for the Canadian Pacific Telegraphs in western Canada, Mr. Ahearn is inspector of rolling stock for the Ottawa Electric Company, and Mr. Grimes is employed as electrical engineer for the contractors who are erecting the new parliament buildings in Ottawa.

Within a few years Mr. Cooney became chief operator of the main office, where he remained until he was appointed manager of the telegraph office in the House of Commons, a position he held until a few months before his death.

It was in this position that Mr. Cooney became the friend and confidant of many of Canada's public men in government service, editors of the influential dailies, and of correspondents from all parts of the country, and at his death these men mourned his loss as that of a personal friend.

Being a first-class operator himself, Mr. Cooney was ever insistent that the men assigned to the Capitol office must be the pick of the profession, with the result that the House (Hu) office had a reputation all over the United States and Canada as an operating room where only the "stars" of the telegraph profession were eligible for employment.

Mr. Cooney is survived by his widow and one son, Alex. Cooney, now chief operator in the New York office of Logan & Bryan.

"The Wire Devils."

The above is the title of a new book written by Frank L. Packard, author of several well known popular novels. In "The Wire Devils" Mr. Packard has produced a book based upon the surreptitious use of a railroad company's telegraph wires for criminal purposes. The "gang," composed of ex-telegraphers and ex-linemen, stage many exciting events which keep the railroad company's detective force on the jump day and night for a long period.

The deviltry of the stunts arranged by the ex-operators is palliated somewhat by a romantic and chivalrous streak in the makeup of "The Hawk," who is the chief plotter. The book contains more sudden twists of fortune and exciting moments than any telegraph novel ever before written.

The price is $1.50 per copy, and it may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THE OLD WIRE CHIEF SAYS: One way of telling when it is time for you to retire and take the pension is when some one catches you talking confidentially to the baker's horse.

BELL TELEPHONE COMPANIES' OFFICIAL CHANGES.

Effective March 1, 1920, the following changes became effective in the service of the various Bell Telephone Companies:

New England Telephone and Telegraph Company.

H. B. Thayer elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

Providence Telephone Company.

E. W. Longley, title changed to vice president.

The Southern New England Telephone Company.

H. B. Thayer elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

New York Telephone Company.

H. B. Thayer elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

The Bell Telehpone Company of Pennsylvania.

H. B. Thayer elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

W. S. Gifford elected director, succeeding F. H. Bethell, resigned.

The Chesapeake and Potomac Telephone Company.

H. B. Thayer elected director, succeeding M. H. Buehler, resigned.

H. B. Thayer appointed member of executive committee.

W. S. Gifford elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

C. A. Robinson, Baltimore, appointed chief engineer. Title of engineer abolished.

Hanse Hamilton, Baltimore, appointed general superintendent of plant, succeeding C. P. Cooper, resigned.

Southern Bell Telephone and Telegraph Company.

H. B. Thayer and Bancroft Gherardi elected directors and members of executive committee, succeeding N. C. Kingsbury and G. D. Milne.

H. B. Thayer appointed chairman of the board.

G. J. Yundt and Leland Hume, title changed to vice president.

F. E. Montague and J. E. Warren, title changed to assistant to Vice President Yundt.

Cumberland Telephone and Telegraph Company.

H. B. Thayer elected director and member of ex-

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ecutive committee, succeeding N. C. Kingsbury, deceased.

G. J. Yundt and Leland Hume, title changed to vice president.

F. E. Montague and J. E. Warren, title changed to assistant to Vice President Yundt.

Chicago Telephone Company.

H. B. Thayer elected director, succeeding N. C. Kingsbury, deceased.

E. G. Drew, Chicago, elected secretary, succeeding W. I. Mizner, resigned.

W. R. Hearne, Chicago, appointed auditor of disbursements, succeeding A. B. Crunden, transferred.

J. J. Kelley, Chicago, appointed auditor of receipts, succeeding H. J. Booth, resigned.

W. J. Boyd, Chicago, appointed assistant secretary, succeeding Frank L. Curtis, resigned.

The Cleveland Telephone Company.

Edgar S. Bloom, E. A. Reed and E. S. Wilson elected directors and members of executive committee, succeeding Alonzo Burt, H. F. Hill and N. C. Kingsbury.

OFFICERS.

President, Edgar S. Bloom, Chicago, Ill.
Vice President, E. A. Reed, Columbus, O.
Secretary and Treasurer, C. L. McNaughton, Chicago, Ill.
Ass't Secretary and Ass't Treasurer, E. J. Farrell, Chicago, Ill.
General Manager, R. G. Pate, Cleveland, O.
General Auditor, A. B. Crunden, Chicago, Ill.
Auditor of Disbursements, F. H. Richardson, Chicago, Ill.
Auditor of Receipts, W. Donaldson, Chicago, Ill.
Chief Engineer, G. A. Kositzky, Chicago, Ill.
Engineer, A. N. Symes, Cleveland, O.
Commercial Superintendent, S. C. Moule, Cleveland, O.
Plant Superintendent, J. P. McGahan, Cleveland, O.
Traffic Superintendent, L. W. Layton, Cleveland, O.
Secretary, E. B. F. Committee, E. J. Farrell, Chicago, Ill.

Michigan State Telephone Company.

DIRECTORS

Blair, Frank W.,	Detroit, Mich.
Clark, Emory W.,	" "
Gifford, W. S.,	New York, N. Y.
Judson, William,	Grand Rapids, Mich.
*Kuhn, Franz C.,	Detroit, Mich.
Thayer, H. B.	New York, N. Y.
*Wilson, E. S.	" " "
Vail, Theo. N.,	" " "
*Waters, D. E.,	Grand Rapids, Mich.

* Executive Committee

Franz C. Kuhn, Detroit, elected president, succeeding B. E. Sunny, resigned.

G. M. Welch elected vice president, succeeding Alonzo Burt, resigned.

H. F. Hill, vice president, resigned.

W. I. Mizner, Detroit, elected treasurer, succeeding Alonzo Burt, resigned.

Frank L. Curtis, Detroit, appointed assistant treasurer and assistant secretary.

Wisconsin Telephone Company.

H. B. Thayer, elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

E. G. Grew, Chicago, elected secretary, succeeding W. I. Mizner, resigned.

W. J. Boyd, Chicago, elected assistant secretary, succeeding Frank L. Curtis, resigned.

W. R. Hearne, Chicago, appointed auditor of disbursements, succeeding A. B. Crunden, resigned.

J. J. Kelley, Chicago, appointed auditor of receipts, succeeding H. J. Booth, resigned.

Central Union Telephone Company.

E. S. Wilson elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

A. B. Crunden, Chicago, appointed general auditor, succeeding John Uprichard.

T. R. Keyes, Chicago, appointed auditor of disbursements.

W. Donaldson, Chicago, appointed auditor of receipts.

John Uprichard, Indianapolis, appointed general manager, succeeding Frank Wampler, resigned.

F. A. Montrose, Indianapolis, appointed plant superintendent, succeeding W. R. Hirst, resigned.

C. R. Woods, Indianapolis, appointed traffic superintendent, succeeding Guy Green, resigned.

The Cincinnati and Suburban Bell Telephone Company.

H. B. Thayer elected director, succeeding Theo. N. Vail.

B. T. McBurney elected Vice President, succeeding Geo. W. Lewis, resigned.

Nebraska Telephone Company.

H. B. Thayer elected director and member of executive committee, succeeding N. C. Kingsbury, deceased.

H. G. Moorhead, Omaha, elected director, succeeding L. H. Korty.

A. A. Lowman and Guy H. Pratt appointed members of executive committee, succeeding E. M. Morsman, Jr., and Theo. N. Vail.

Roy A. Walker, Omaha, assistant to president.

Iowa Telephone Company.

H. B. Thayer elected director, succeeding N. C. Kingsbury, deceased.

A. A. Lowman and Guy H. Pratt appointed members of executive committee, succeeding N. C. Kingsbury and J. L. Parish.

Roy A. Walker, Omaha, asssistant to president.

The Northwestern Telephone Exchange Company.

H. B. Thayer elected director, succeeding N. C. Kingsbury, deceased.

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Guy H. Pratt appointed member of executive committee.

Roy A. Walker, Omaha, assistant to president.

The Southern Telegraph and Telephone Company.

H. B Thayer elected director, succeeding N. C. Kingsbury, deceased.

J. P. Crowley elected director.

J. F. Bratney, assistant to vice president, resigned.

Claude Nowlin, Dallas, appointed general solicitor.

Southwestern Bell Telephone Company (Mo.)

J. F. Bratney, assistant to vice president, resigned.

Southwestern Bell Telephone Company (Oklahoma).

N. C. Kingsbury, director and member of executive committee, deceased.

H. B. Thayer and O. N. Dailey elected directors.

J. M. Noble appointed member of executive committee.

J. F. Bratney, assistant to vice president, resigned.

The Mountain States Telephone and Telegraph Company.

E. B. Field, director, first vice president and treasurer, deceased.

L. C. Phipps, Jr., Denver, elected director.

F. H. Reid appointed general manager.

The Pacific Telephone and Telegraph Company.

N. C. Kingsbury, director, deceased.

R. O. Hoedel, San Francisco, appointed auditor of receipts, succeeding C. H. Weldon.

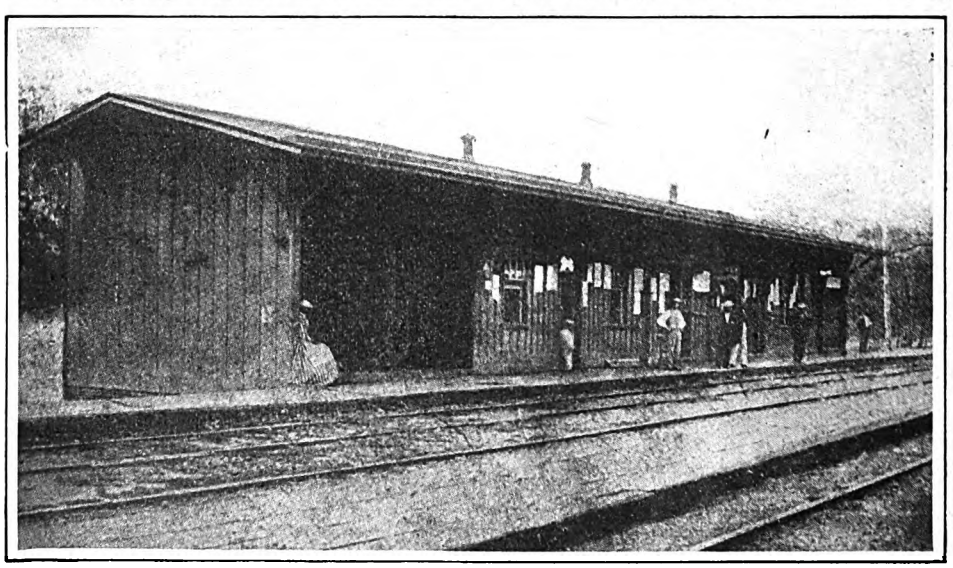
ORIGINAL RAILROAD DEPOT AT RELAY, MD.

We present herewith a reproduction of an old photograph recently unearthed by H. R. Howser, of the Railroad Administration at Washington. The picture shows the Baltimore and Ohio Railroad station at Relay, Md., as it appeared from the time it was erected in the year 1832, two years after the railroad was opened, until it was demolished in the year 1890 to make room for a modern signal tower. As a passenger station the building was abandoned in the year 1873, serving from that time until taken down as a tool house for the railroad gardener.

This old building is famous in telegraph history, for it was here that Professor Morse and Alfred Vail set up their telegraph apparatus on the line from Washington, built in the year 1844, and which in May of that year was completed to Baltimore, Md.

During the months of April and May, 1844, Morse and Vail spent a considerable portion of their time in this old building. Preliminary tests were carried on between the depot at Relay and the office in Washington. Finally, on May 22, 1844, the instruments were removed from Relay and set up in Baltimore, in what at that time was known as the "upper depot," later the Mount Claire station of the Baltimore and Ohio Railroad.

Two days later—on May 24, 1844—the famous first message was sent from Washington to Baltimore, reading "What hath God wrought!"



ORIGINAL RAILROAD DEPOT AT RELAY, MD.

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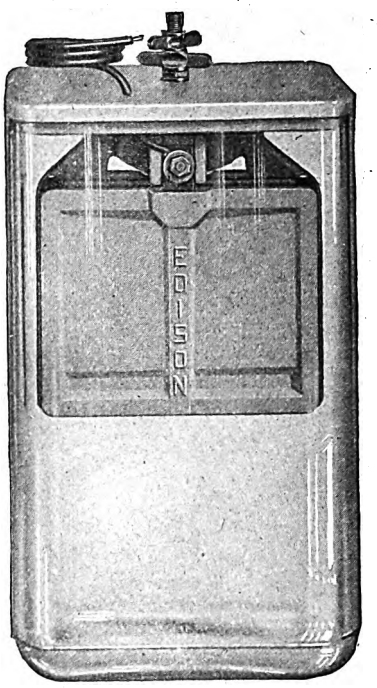
FOR CLEAR TRANSMISSION



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THE RAILROAD
TELEGRAPH AND TELEPHONE

American Railroad Association — Telegraph and Telephone Division.

Committee No. 2, Construction and Maintenance, Inside Plant, R. F. Finley, chairman, held a meeting in Chicago on March 19.

Committee No. 4, Protection Against Lightning and Electric Light and Power Circuits, I. C. Forshee, chairman, will hold a meeting in New York on April 20 and 21.

I. C. FORSHEE, electrical engineer, telegraph department, Pennsylvania Railroad System, was a New York business visitor on March 15 and 16.

STANLEY RHOADS, formerly telegraph and telephone engineer on the staff of E. C. Keenan, general superintendent of telegraph, Eastern Region, United States Railroad Administration, was on March 1, transferred to a like position in the telegraph department of the New York Central Railroad, New York.

C. W. L. MICKLEY, on March 1, was appointed to his former position as superintendent of telegraph of the International and Great Northern Railroad, with headquarters at Houston, Tex.

Pennsylvania Railroad System.

In the reorganization of the Pennsylvania system since the return of the railroads to private control on March 1, quite radical changes have been made in the telegraph and telephone department.

Formerly the system was divided into two general sections, known as Lines East and Lines West, with a superintendent of telegraph for each section located at Philadelphia and Pittsburg, respectively.

The new organization provides for the consolidation of the telegraph, telephone and signal departments under the supervision of a superintendent of telegraph and signals, with an assistant superintendent of telegraph and signals in each of the four regions into which the system has been divided.

The apparatus, methods and practices will be standardized and the service co-ordinated by a general superintendent of telegraph and a chief signal engineer, each having supervision over the entire system, with headquarters in the general office at Philadelphia.

The general superintendent of telegraph reports to C. M. Sheaffer, chief of transportation on the staff of W. W. Atterbury, vice-president, in charge of operation. Mr. Sheaffer was formerly general superintendent of transportation and earlier superintendent of telegraph for Pennsylvania Railroad, Lines East.

These organizations, so far completed, are as follows:

G. A. Cellar, general superintendent of telegraph, Philadelphia, Pa.

I. C. Forshee, electrical engineer, Philadelphia, Pa.

Jacob Bright, chief clerk, Philadelphia, Pa.

A. H. Rudd, chief signal engineer, Philadelphia, Pa.

F. H. Buchanan, asst. chief signal engineer, Pittsburg, Pa.

EASTERN REGION

J. D. Jones, superintendent of telegraph and signals, Pittsburg, Pa.

W. N. Spangler, assistant superintendent of telegraph and signals, Philadelphia, Pa.

CENTRAL REGION

W. M. Post, superintendent of telegraph and signals, Pittsburgh, Pa.

L. Behner, assistant superintendent of telegraph and signals, Pittsburg, Pa.

NORTHWESTERN REGION.

C. W. Hixson, superintendent of telegraph and signals, Chicago, Ill.

O. L. MCCREARY, assistant superintendent of telegraph and signals, Chicago, Ill.

SOUTHWESTERN REGION.

E. B. Pry, superintendent of telegraph and signals, St. Louis, Mo.

Chicago, Rock Island and Pacific Railroad.

The telegraph department has recently held business conferences of head office and local officials at Topeka, Kas., El Reno, Okla., and at Des Moines, Iowa. The meetings have been under the direction of George D. Hood, superintendent of telegraph, and A. W. Douglas, assistant superintendent of telegraph.

The conference at Topeka was held on February 26. Those in attendance included F. H. Kahl, traffic supervisor, Chicago; A. Hafford, Trenton, Mo.; H. E. McKay, Davenport, Ia.; R. K. Patterson, Chicago; J. C. Stickley, El Reno, Okla.; C. H. Jones, Topeka, Kan.; W. T. Casey, Kansas City, Mo.; G. W. Marmon, Goodland, Kan.; W. V.

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Corp, Fairbury, Neb.; W. Z. Hamilton, Des Moines, Ia.

H. E. McKay has been appointed manager and wire chief at Davenport, Ia., vice A. F. Hasselman, deceased. At the same office E. J. Brennan has been appointed night chief operator; A. S. Wilson, late night chief operator, and F. R. Collins, repeater attendant.

S. P. Aspes, has been appointed manager and wire chief at Fort Worth, Texas, vice F. H. Kahl, transferred.

Telegraph and telephone inspectors are stationed at Topeka, Kan., and Des Moines, Ia., and a telegraph and telephone supervisor at Davenport, Iowa.

THE EFFECT UPON SIGNALING OF RESIDUAL MAGNETISM IN RELAY MAGNET CORES.

By B. O. Lenoir, Lieut. Col. Signal Corps.

As far back as the year 1892, the writer observed that the presence of residual magnetism in the cores of relays affected the operation of single line Morse instruments. The effect which residual magnetism has upon signaling is quite pronounced when lines are operated with currents of small strength, and may be a serious consideration at the non-battery end of a line when line insulation is at a low value due to rain or fog.

In one instance a relay was found to be inoperative even with the most delicate adjustment of the armature. Investigation developed the fact that the cores held a certain amount of permanent magnetism, and when the armature was given the advantage of very low spring tension the cores attracted the armature and prevented it from responding to the opening and closing of the distant line key. Had the cores been perfectly neutral and free from residual magnetism a light spring tension would have withdrawn the armature from the local-circuit contact; and, the spring tension being light, the armature would respond to small current strength in the magnet due to the closing of the distant key.

On another occasion the writer investigated a case of faulty operation and found that the cores of a relay were heavily magnetized. The current in the line circuit, although of sufficient strength to operate the relays if properly neutral, was just strong enough to overcome the magnetism of opposite sign already in the cores. The result being that the closing of the distant key caused the relay to open, producing the action known as "backstroke."

Recently at Fort Worden, Wash., with the new Signal Corps 60-ohm relays in service on the open circuit submarine cables, with the customary five battery cells at Fort Worden, the Seattle office received clearly defined signals, but the Fort Worden office could not get intelligible signals without an increase of battery at Seattle. When the wires leading into and out of the relay at Fort Worden were reversed, Seattle's signals then reached Fort Worden without the additional cell being added.

It would appear that while relays when new may be without residual magnetism in the cores, after they have been in service more than a few weeks they acquire a sufficient amount of it to cause operating difficulties.

Experiments which have been made in view of the experiences herein referred to show that in circuits operated on low current values (below 20 milliamperes) relay connections should be made so that the direction of magnetization in the relay coil windings will add to the magnetic strength of the cores—already there as residual magnetism—and not tend to reverse the magnetism.

Test has shown that a number of relays connected in a circuit required a current of eight milliamperes for satisfactory operation when the incoming current was required first to neutralize existing residual magnetism before being able to affect the armatures, while with the relay connections reversed a current of four milliamperes operated the 60-ohm relays satisfactorily. With fine adjustment these relays will operate satisfactorily on a current strength of five milliamperes, but in practice it is usual to maintain a current strength in the line of from ten to twelve milliamperes.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa

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Students' Course in Technical Telegraphy

ARTICLE No. 2.

Multiple Circuits.

Plain examples of multiple circuits are shown in Figs. 3 and 4. Fig. 3 illustrates two vibrating bells or buzzers in circuit with two cells of battery and a push button. The bells are connected in multiple, while the push button and battery are in series. It is evident that when the button is pressed, current from the battery will flow through the coil windings of both electric bells, thus operating the bells simultaneously.

The reason for the multiple connection in this case is that it is found that two or more electric bells connected in series do not work satisfactorily. With the bells connected in series a dirty contact

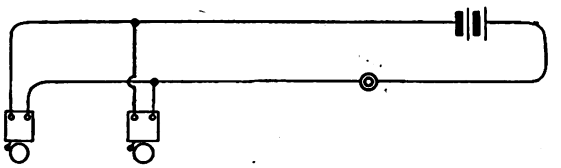

FIGURE 3.

point, or other defect, in one bell would open the circuit so that the other bells in circuit would not operate when the button is depressed. By connecting the bells in multiple an open contact in one bell circuit does not prevent the remaining bell, or bells, from responding when the push button is pressed.

In the circuit arrangement shown in Fig. 4 it is evident that one electric bell may be operated by pressing any one of the push buttons, *C*. In this

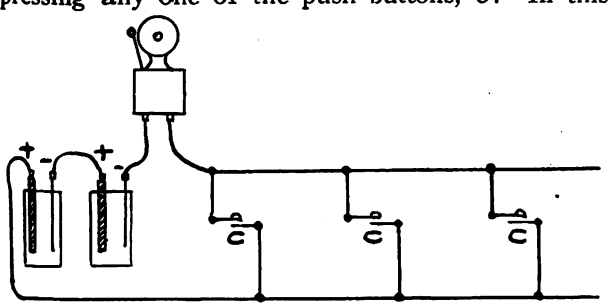

FIGURE 4.

case the bell and the battery are in series and the push buttons are connected in multiple. In Fig. 3 it may noted that the bells are operated from one point only. If it were desired to operate the bells in Fig. 3, from three positions, the push buttons would not be connected all in series as is the single button in that Figure. Instead, the three push buttons would have to be connected in multiple as shown in Fig. 4. Also, the battery would have to be moved from the position it occupies in Fig. 3 to the position it occupies in Fig. 4. Obvi-

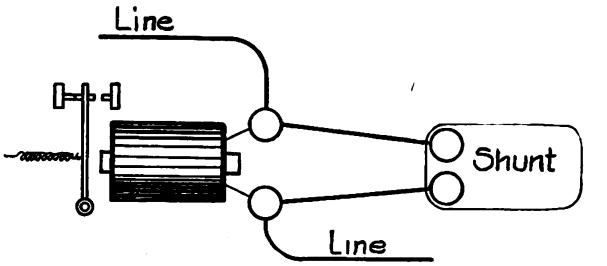

FIGURE 5.

ously if the three push buttons were connected across the pair of wires, between the battery and the first bell in Fig. 3, pressing any one of the buttons would simply short-circuit the battery, and practically no current would flow through the coil windings of the electric bells.

The word *shunt* is one frequently encountered in electrical work, and the illustration, Fig.. 5, shows a main line telegraph relay with a shunt

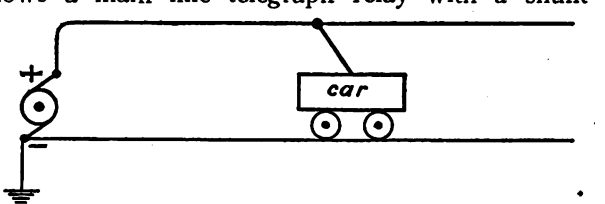

FIGURE 6.

resistance connected in parallel with the windings of the relay. In this case the shunt is so connected for the purpose of "shunting" a part of the line current through a path external to the relay. If the resistance of the shunt is equal to the resistance of the relay windings, then one-half of the current will pass through the shunt and one-half through the relay. If the resistance of the relay is 150 ohms and the resistance of the shunt is 300 ohms, then one-third of the current will pass through the shunt winding and two-thirds through the relay winding.

Another simple example of multiple connection is that illustrated in Fig. 6. This is the well known trolley car wiring, wherein the electric generator shown at the left has one of its brushes connected to an overhead trolley wire, while the other brush of the generator is connected to the track rails and

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to earth. Obviously, when but one car is on the rails the motors are connected in series with the generator, but when two or more cars are on the rails, the motors of the various cars are connected in multiple between trolley wire and rails.

In a later lesson, when we come to a consideration of circuit resistance values and current strengths, it shall be made plain that when instruments are connected in multiple across a pair of battery leads the total resistance is lower than when the instruments are connected in series.

(To be continued.)

Earth Current Telegraphy.

Capt. L. C. Carus-Wilson. (*The Royal Engineers' Journal*, January, 1920.)—If an electric current is sent into the earth at one point and leaves it at another, it travels from one point to the other, not in a straight line, but along a series of curved paths. If the two free ends of two wires attached to a receiving instrument are inserted into the earth at some distance from each other, and not far from the earth current just mentioned, they will have a difference of potential and a current will flow through the receiving instrument. If it is a telephone current which flows through the earth, and if the receiving instrument is a telephone, then in the latter may be heard the message picked up from the earth. To magnify the sensitiveness of the receiver the French introduced the "Low Frequency Amplifier," three valves in cascade, with total magnification of 125, by which telephone conversations could be overheard at a distance of several thousand yards. The Huns captured one of the valves, saw for what it was used, and at once applied it themselves. There ensued a war of wits, each side endeavoring to overhear the messages of the other side and to keep its own messages from being intercepted. By the "Fullerphone" messages could be sent by the Morse code without danger of being picked up.

By picking up current from the earth, signal messages were sent from one part of the Allied line to another. The secondary of a "Bower Buzzer" (weight 6 pounds and fifty times as strong as a telephone buzzer) was earthed at both ends. The receiving amplifier was likewise earthed at two points about 200 yards apart. The nature of the soil determined the distance over which signals could be sent. In the muddy soil of Flanders the range was 2,000 yards under conditions for which the range on the Somme was doubled. The reason was that in the latter region, which has 6 feet of earth with chalk beneath, the electric currents were confined chiefly to a surface layer.

Hard to Insult.

The delivery department caught this one before it was sent out for delivery: "Fire was caused by defective wiring. Wire was not properly insulted." The missing "a" was perhaps added in somewhere else later on.

Morse Tournament Proposed.

Rapid senders among the Morse operators in New York, Boston, Chicago, Philadephia, and other telegraph centers at the present time are enthusiastically discussing the subject of a Morse Fast Sending Tournament to be held some time during the Fall months this year.

Thomas E. Brickhouse, the present holder of the Carnegie diamond medal, which he won at the San Francisco tournament of 1915, is now located in New York, in charge of the leased wire telegraph service of E. F. Hutton & Co. Mr. Brickhouse has on his operating force several operators who are recognized as very rapid senders.

F. M. McClintic, who a few years ago won many medals and cups for fast sending, is again located in New York, after serving as a captain in the Signal Corps during the past two and one-half years. W. M. Gibson, one time Carnegie medal holder, is still in the telegraph business in New York, as are many other old-time star senders.

It is a remarkable fact that in all tournaments held up to the present time the championship has been captured by hand senders in competition with users of semi-automatic transmitters. The next contest will be participated in by an entirely new generation of fast Morse senders who have been brought up on "bugs," and it will undoubtedly be an exciting battle between the old stars and the new.

In TELEGRAPH AND TELEPHONE AGE from time to time we have published reports of spurts of fast sending in actual service, and operators' performance averages over periods of one month, six months, and one year. In our issue of March 16 was published a report of the performance of Walter Flynn, in Western Union service at Cincinnati, Ohio, who handled 102 telegrams per hour for a period of eight hours, and an average of 66 messages per hour over a period of six months.

At the San Francisco tournament there was a contest between radio operators which attracted a great deal of interest, and at the next speed trial the radio operators will be much in evidence. In radio service the semi-automatic transmitter is now widely used, and the land line telegraphers who have entered radio service are setting a pace which compares favorably with land line operating speeds.

It is probable that in the next tournament more stress will be laid upon the requirement of "all round" expertness. The operator who can fill any telegraph position, be it sending or receiving, railroad or commercial, brokerage work or press, is, of course, the best all 'round operator.

At past tournaments there has been a demand for a test of sending 250 or 500 words straight matter. The operator who can transmit 500 words of intelligible Morse in the shortest space of time—regardless of any other expertness he may be capable of—ever has been regarded as the speed King. In the contest now proposed it may be well to include a test of this kind; but it may not follow that the winner of the test shall be awarded the top prize.

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QUESTIONS AND ANSWERS

Carnegie Pensions.

W. R. E.—In the year 1908 Andrew Carnegie arranged for the payment of a twelve dollars per month pension to operators employed in the military service during the Civil War, because no provision had been made by the Government to pension the ex-telegraphers. Up to date $175,000 has been paid out as pensions, and at the present time the pension list includes fifty-eight men and forty-two widows. One stipulation made was that ex-Civil War telegraphers wishing to receive the pension should apply for same giving the necessary information about their military service.

Telegraph Problems.

H. E. R.—Answering your questions in the order submitted:

1. Relative to the voltage and current in telegraph lines of about 500 miles in length it may be said that for lines operated single, there should be a current in the line of approximately 55 milliamperes. The voltage necessary to yield current of this strength depends upon the resistance in ohms of the line wire and connected relays. To take a typical case let us assume a line 500 miles long made up of No. 8 iron wire (12.37 ohms per mile) and having six 150 ohm relays connected in circuit. Here we have a wire resistance of 6,185 ohms, and an instrument resistance of six times 150, or 900 ohms—a total resistance of 7,085 ohms. If motor-generators are employed to supply the voltage; then, in order to produce 55 milliamperes through a resistance of 7,085 ohms, the total voltage of the generator should be 390 volts. This, however, is based upon a perfect line; that is, a line perfectly insulated. In practice it is found that all lines have a certain amount of current leakage, so that if the 390 volt potential is applied at one end of the 500 mile line, it may be found that at the non-battery end the received current has dropped to perhaps 30 or 35 milliamperes, due to loss in leakage. It is customary to divide the total battery between the two terminal stations, so that in the case under consideration if a 200-volt machine is placed at each end of the 500 mile line, positive to line at one end and negative to line at the other, the line should operate satisfactorily.

2. If the 500 mile line is duplexed the current conditions will be about the same as in the single line. One difference may be that but two main line relays are in circuit, one at each end of the line. This would reduce the total resistance correspondingly. Also, at each end of the line it is usual to employ two separate main line batteries, or motor-generators, each having a voltage sufficient to produce the required current in the line. The operation of the duplex transmitter applies first negative potential, and then positive potential to line—one at a time.

3. The voltage and current conditions in lines of any length, from 50 to 1000 miles, may be calculated as in the foregoing. It should be remembered that regardless of the length of the line good operation requires a line current of about 55 milliamperes.

4. If primary batteries are used in place of motor-generators, it is to be remembered that each cell of battery has a resistance of about two and one-half ohms, which must be totaled for the entire battery and added to the resistance of line wire and instruments in calculating current strength.

5. Ordinary induction coils are not used in telegraph circuit operation. The old Edison phonoplex system employed an induction coil, but so far as we know none of these sets are now in service. In a sense, however, the retardation coils used in the Western Union duplex and quad circuits (5-U coil), and the retardation coils used in simultaneous telegraphy and telephony, are induction coils.

6. Current and voltage values in quadruplex Morse circuits are the same as in duplex working as above described, except that the 'neutral' side of the system is operated by raising and lowering the line current strength. This is accomplished by means of the neutral side transmitter. With the

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neutral side key closed a current of about 75 milliamperes flows in the line circuit and with the same key open a current of 25 milliamperes flows in the line. The voltages used range from 220 to 400.

7. The use of induction coils in telephone transmitters is for the purpose of greatly increasing the strength of the talking currents sent to line. Low voltage (4 to 12 volts) batteries are used in the telephone transmitter induction coil circuit. The secondary coil of the unit sends out currents of much higher voltage. Telephone induction coils have no moving parts. The iron core has a low resistance winding and a high resistance winding on it, making up what might be termed a transformer. Induction coils which have vibrators, or automatic circuit-breakers attached to them, or associated with them, are used in radio telegraph work, in X-ray work, and other high frequency undertakings. The vibrator automatically opens and closes the primary circuit of the induction coil as long as the battery circuit is held closed.

8. Condensers used in telephone circuits have many uses. A condenser connected around contact-making points reduces sparking. A condenser in series in an electric circuit passes alternating current, but stops the flow of direct current. In telegraph work condensers are employed in duplex and quadruplex circuits to compensate for the electro-static capacity of line wires. When a duplex line is balanced the condensers associated with the artificial line are adjusted to have a capacity equal to about one-half of that of the line wire. The same provision is made at each end of the circuit.

9. When it is found that relays work more vigorously on a rainy day than in dry weather, it will be found that the relays giving this indication are near the battery end of the line. If a line has battery at one end only, then, during wet weather the relays near the battery end will have larger current flowing through them than in dry weather because of line leakage. This means that the current does not have to flow in full strength to the distant end of the circuit to find an earth contact; but reaches ground by way of wet cross-arms and poles. Of course, the relays at the distant end of the line, or beyond the half-way point will be found to work more feebly because they are receiving less current than when the weather is dry and no current is being lost due to leakage toward the batteried end of the line.

10. Locating faults during wet weather is more difficult than when the line is clear. Careful adjustment of relays is necessary in order that the weak current flowing through relays remote from the battery may attract their armatures. The remedy is to keep line wires clear of trees, supports, and any obstruction which may conduct current to earth when rainy weather prevails. In other words, lines should be maintained in a state of high insulation.

11. In telegraph work rheostats are used to form artificial lines in duplex and quadruplex circuits. When the system is balanced the artificial line has the same resistance as the main line wire and instruments at the distant terminal office.

12. Duplex circuits are found to work satisfactorily during wet weather when lines operated as single Morse circuits fail. Duplex relays work satisfactorily on smaller current margins than single Morse relays. The neutral side of a quadruplex circuit may fail at the same time single lines fail. The polar side, however, may continue to operate satisfactory until conditions become worse.

13. Printing telegraph systems employ relays similar to those used in duplex Morse operation and are generally subject to the same disturbances that interfere with Morse operation.

14. Many inventions have been made covering the transmission of photographs by telegraph, but none of these systems has proved entirely satisfactory. Some day a satisfactory system may be developed. There should be a field for such a system.

15. Printing telegraphs as at present used in this country operate over circuits as long as those used for Morse duplex working.

16. Condensers or induction coils should not be inserted in series with either Morse or printer circuits. The condenser would open the circuit and the induction coil would introduce unnecessary inductance.

17. Relative to your questions concerning the effect of connecting an induction coil in a circuit; it may be well here to point out that the term "induction coil" generally signifies a primary and a secondary winding upon a common iron core. There are two circuits, a primary and a secondary. An "inductance" coil may be a single winding upon an iron core, with but one circuit. The effect of inserting an inductance coil in a circuit is that the circuit is made more sluggish. To illustrate: If a semi-automatic Morse transmitter is connected in series with a four-ohm sounder and two cells of dry battery, the sounder will follow the fastest, sending clearly, but if an inductance coil be inserted in the circuit, even if it adds but two or three ohms resistance to the circuit, the effect will be that the sounder registers a long dash instead of the dots of a letter *h* or a letter *p*.

18. Induction coils so constructed that the iron core may be withdrawn have an adjustable current transformation. With the core entirely withdrawn, the current in the secondary circuit will have minimum increase, while with the core inserted all the way in, the secondary current will be of maximum strength for that coil. If such a coil is used only as an inductance unit (one winding), then with the core all the way in, the inductance is a maximum.

19. The Ghegan "kick-off" device is used on single lines only. It is of value on poorly insulated lines. It is in use on several railroad lines.

20. Cablegrams are received on tape, the signals appearing in the form of a wavy line representing the dots and dashes of the telegraph alphabet. The receiving operator copies the cablegram on a typewriter, either by reading the incoming tape directly, or from the sending of another

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operator who reads the tape and by means of a key and sounder sends the message to the transcribing operator.

21. Radio communication between the United States and South America is promised for the near future. It is understood that the erection of stations will soon be begun.

ADJUSTMENT OF ALTERNATING CURRENT RELAYS.

The rapid replacement of direct current by alternating current in public service electric systems, has brought about a situation where telegraph and other signal systems requiring direct current for circuit operation have to employ methods of converting alternating—into direct current or of using relays which will operate on alternating current.

The alternating current relays now in use have been found to give satisfactory service on short wires; especially those used for district service, where the line has a length of not more than a mile or two. On wires of this length it is not necessary to employ resonance devices, as is the case when lines of fifty miles or longer are operated by alternating current.

Ordinary direct current relays when operated by alternating current produce a very objectionable noise due to constant buzzing of the armature of the relay while the circuit remains closed; and, as in call circuit systems, the circuit is closed normally, the use of direct current relays for the purpose is out of the question. A type of alternating current relay used by the Postal Telegraph-Cable Company for district service consists of a standard direct current type relay with a cushion closed-contact point. While alternating current at 60 cycles flows through the coils of the relay the armature vibrates in response to the alternations of current, but the action of the cushion contact is such that the armature does not part from the closed contact point except when the line circuit is opened interrupting the alternating current supply. This reduces the buzzing sound to a minimum and maintains the local circuit closed as long as the main line remains closed.

The use of these relays avoids the necessity of installing primary battery or the installation of motor generator sets to replace abandoned direct current public service supply.

The relays work well under ordinary conditions; one installation of thirty-six relays gave good service over a period of a year with practically no attention. Ordinarily, a knowledge of direct current relay adjustment is all that is required. The magnets may be moved closer to, or farther away, from the armature by means of an adjusting screw. The spring tension on the armature is regulated in the same manner as in direct current relay adjustment.

For the information of installers and district service maintainers we submit herewith instructions which may be followed in adjusting alternating current relays when first installed, or when trouble is experienced with them in service. The procedure has been outlined by John H. Mayer, of the division engineer's office, Postal Telegraph-Cable Company, New York:

"After the relays have been properly connected, open the line circuit so that the relay armatures fall back against their back-stops. Leave the local battery closed and adjust the tension of the retractile spring of each relay armature until the local circuit closes solidly—a minimum spring tension reduces to a minimum the noise from alternating current relays. Then, with the line closed, proceed with magnet coil adjustment until satisfactory operation is obtained; holding, with the fingers, the armature of one relay of a circuit while the adjustment of the companion relay is being made. Where vibration noise still appears it may be reduced by careful adjustment of the spring tension of the cushion contact.

"The current in an alternating current circuit is influenced to a considerable extent (as high as 10 per cent) by the air gaps between the cores of the magnets and the armatures of the relays. For this reason it is advisable to maintain as wide an air gap in the first relay on a circuit as is consistent with good operation, so that the relay on the return half of the circuit may be kept working satisfactorily when leaky circuit conditions prevail."

"The Sword and the Soul."

The above is the title of a new book by Col. W. R. Plum, the veteran telegrapher of civil war fame. The story deals with the adventures during the war of a Union telegrapher who had many hairbreadth escapes, and who performed many ingenious exploits in erecting and maintaining telegraph lines for the use of the Federal military forces.

The story is cleverly written; the plot is absorbing; the book is well illustrated and beautifully bound. $2.00 per copy from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON AND BLACK

And we can highly recommend it to our readers.

$2.50 per copy.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

POSTAL TELEGRAPH-CABLE COMPANY.

E. P. TULLY, assistant to the general manager, has returned to his desk at New York, after an extensive trip which included practically every important place in the southern division and Mackay Telegraph Company territory.

J. J. WHALEN, traffic manager, is visiting the larger western relay points in connection with general traffic matters.

H. W. HETZEL, traveling auditor, has been spending several weeks at general headquarters, New York.

C. G. KNAPP, formerly chief clerk, to General Superintendent G. W. Ribble, and later manager at Jackson, Miss., has been transferred to Nashville, Tenn., as manager of that office.

THE WILMINGTON, DEL., office has just been moved to a new location on the corner of Eighth and Shipley Streets. This change was necessary on account of growth of business, the old location proving inadequate. Manager Young is very proud of the new location and feels confident he will have an office second to none when the new equipment and furniture is installed.

AT OMAHA, NEB., a new branch office has been established in the Saunders & Kennedy Building, 18th and Douglas Streets, to take care of the rapidly growing business in that section of the city.

MANAGERS APPOINTED: L. Cobb, Greeley, Colo.; C. J. Kreckel, Easton, Pa.; B. D. Nethery, Princeton, N. J.; W. E. Quint, Middletown, Ohio; M. McCarthy, Marinette, Wis.; M. McDaniels, Muskegon, Mich.; G. Gory, La Salle, Ills.; W. D. Tenner, St. Augustine, Fla.; J. H. Speer, Lowell, Mass.; E. G. Pavey, Ypsilanti, Mich.; B. Pitcher, Campaign, Ills.; H. R. Hicks, Rossville, Ga.; Josephine De Sourdy, Holland, Mich.; H. E. Jones, Temple, Tex.; F. R. Philpot, Greenville, N. C.; R. H. Mills, Huntington, W. Va.; A. M. Hook, Bucyrus, Ohio; and R. R. Sawyer, Orrville, Ohio.

HENRY B. WHALEN, operator at Newport, R. I., has been appointed manager in that city, vice Joseph Doran, resigned.

New York Operating Department.

FRANK HENNING, night northern traffic chief, who in his younger days won fame as a Shakesperian actor, gave a very pleasing entertainment to a large audience in the Fenimore M. E. Church, Brooklyn, recently.

AMONG the operating department visitors during the past month we recall Ned Keefe of the Buffalo office and John Schmitt, formerly in the service department, but now with the New York Police Department.

F. R. TRACY has been transferred to the Cotton Exchange office on account of increased business there.

New York City Notes.

THE PRODUCE EXCHANGE office will be moved on May 1 to new quarters at Beaver and Whitehall Streets, where the necessary space has been obtained for increased equipment in order to properly handle the business.

ANOTHER BRANCH OFFICE where increased business has forced changes is the 20 Broad St. office. Here it has been necessary to refit the entire basement in order to secure much needed room.

Sixth District Notes.

MISS JEAN MCFALL, cashier, Pittsburg, Pa., is again on duty after an absence of a month due to illness incidental to the death of her mother.

A FIRE at Cumberland, Md., destroyed the rear part of the office at that place on the morning of March 8. Manager Smeltz arranged for temporary quarters and had traffic moving without the slightest delay. Both he and Lineman Gibbs were complimented for their splendid work in the emergency.

ANOTHER INSTANCE of initiative on the part of a manager in this district was at Oil City, Pa., where a flood of considerable proportions in the business district was caused by an ice gorge in the Allegheny River on March 13. There were from 6 to 8 inches of water in the office when manager Dolby arrived, but he promptly arranged to handle business from temporary quarters, the wire being taken care of by operator Thos. Duerner, while the

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manager himself, donning a pair of rubber boots, remained in the office to handle telegrams by telephone, and to see that calls for messengers were promptly answered.

Third District Notes.

C. E. BAGLEY, superintendent has just completed an inspection trip visiting offices at Baltimore, Washington, Wilmington and Atlantic City.

S. J. PICKERING, manager at Easton, Pa., for many years, has been transferred to the managership of an important branch office in Baltimore, Md. He is succeeded at Easton by C. J. Kreckel.

Philadelphia Items.

MISS MARGARET MURPHY, assistant route clerk, who was recently operated on for appendicitis, is on the way to recovery.

J. J. HARDY, chief clerk to superintendent Bagley, has the sympathy of his friends in the loss of his wife, who died March 22 after a few days illness. Mrs. Hardy was formerly Miss Anna Ryan of the bookkeeping department and was one of the most popular young ladies in the Postal main office.

J. R. GORSUCH, district foreman, has returned from an inspection trip through Baltimore and Washington districts.

J. W. HARRISON is among the new arrivals in the operating department.

EDWARD PRICE of the fast New York-Philadelphia bonus night circuit has resigned to accept a position with Hughes and Dier, brokers.

W. M. FITZGERLAND, city foreman, has returned to duty after being confined home on account of illness.

REV. H. K. HOLTZINGER, formerly an expert telegrapher employed in this office, has gone to Mexico City, Mex., where he will have charge of the Methodist Episcopal church.

ALVIN R. SWENSON, formerly a telegrapher in this office, is now manager of the largest Ford automobile agency in Philadelphia.

Dot and Dash Club's Annual Meeting.

The annual meeting of the Dot and Dash Club, of Philadelphia, Pa., was held on March 22. The election of officers resulted in C. E. Bagley being made president; A. S. Weir, first vice-president; J. S. Calvert, second vice-president; J. M. Jones, third vice-president; F. W. Griffin, fourth vice-president; R. C. Murray, secretary, and J. H. Wilson, treasurer.

The Board of Governors of the Club includes E. C. Boileau, J. A. Chapman, F. E. Maize, I. D. Maize, John Wintrup, A. G. Wallace, J. W. Collins, T. B. Kingsbury, E. W. Miller, A. H. Sprackle, H. M. Brown and A. G. Strickland.

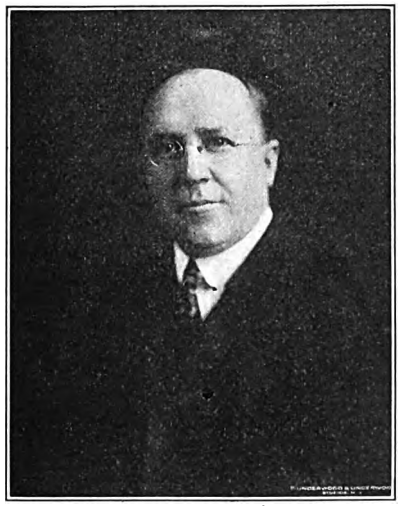
Plans are now being made for a Spring dinner to be given in May.

RECENT PROMOTIONS IN THE SERVICE OF THE POSTAL TELEGRAPH-CABLE COMPANY.

The accompanying photographic reproduction is a recent likeness of John F. Skirrow, who on March 1, was appointed chief engineer of the Postal Telegraph-Cable Company, New York.

Mr. Skirrow has been in the service continuously since the year 1887, when he entered the company's employ as telegraph operator. From the beginning of his telegraph career Mr. Skirrow centered his attention upon the technical side of the business, with the result that he progressed through the various grades of chief operator, assistant manager, division electrical engineer, and associate electrical engineer. He has been intimately identified with the development of the company's inside plant and apparatus, and has taken out a large number of patents covering inventions of telegraphic devices.

JOHN F. SKIRROW



JAMES P. O'DONOHUE

As the head of the Plant and Engineering Department of the company, Mr. Skirrow will be in

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responsible charge of all engineering matters for the entire system.

James P. O'Donohue, assistant chief engineer of the Postal Telegraph-Cable Company, although still a young man, has had twenty-seven years' experience in the operating and engineering departments of the company. In the year 1893 he was employed as operator in the Boston, Mass., office, afterward serving as quadruplex chief operator, assistant traffic chief, assistant wire chief, and later as electrician of the Boston district. In 1909 he came to New York as a member of the chief engineer's staff, a year later being appointed division engineer of the Eastern Division. Mr. O'Donohue continued in this position until March 1, 1920, when he was advanced to his present position of assistant chief engineer.

Mr. O'Donohue has a thorough theoretical and practical knowledge of telegraph operation, and of joint telegraph and telephone operation. He has

DAVID H. GAGE

planned and carried out the work of installing many of the company's largest terminal plants. His new duties will include jurisdiction over operation and installation work throughout the entire country.

David H. Gage, on March 1, 1920, appointed division engineer, Eastern Division, of the Postal Telegraph-Cable Company, has been twenty-four years in the service. He was first employed in the construction department, and later became assistant chief operator of the repeater station at Albany, N. Y. Subsequently, Mr. Gage was transferred to the division engineer's office in New York, and later was appointed district electrician of the Philadelphia, Pa., district. In the year 1911 he was brought to New York as a member of the chief engineer's staff, where he carried out various important engineering undertakings.

During the past six years Mr. Gage has been engaged principally on work throughout the Eastern Division, with the title of assistant engineer. As division engineer of the Eastern Division he will have charge of all inside plant installation in that territory, which includes the cities of Boston, New York, Philadelphia, Washington, Pittsburg, and Buffalo.

New York Telegraphers' Aid Society.

The annual election of officers of the New York Telegraph Aid Society was held on March 30, and the annual meeting of the Social took place on March 31, in Room 1702, No. 24 Walker St.

The nominations for officers were: President; A. M. Lewis, and C. J. Lemaire: Vice-President; R. J. Marrin, and R. N. Kelly: Treasurer; T. M. Brennan: Financial Secretary; C. A. Kilfoyle: Recording Secretary; Mary E. Saunders: Executive Committee; E. J. Oakley, J. V. Riddick, O. H. Browne, and J. J. Keefe: Auditors; F. J. Nurnberg, J. F. E. Hopkins, and H. M. Heffner. Four members of the Executive Committee, and three Auditors were elected.

Electrical Aid Society of Philadelphia.

The Electrical Aid Society of Philadelphia, Pa., has made arrangements for a concert and dance to be held on April 7, at Mercantile Hall, Philadelphia.

IT WAS A RAINY DAY and messenger No. 23 had hard luck keeping his messages dry. One person to whom the boy delivered a telegram remarked that the envelope of the message was inexcusably wet. For a moment the lad was hard pressed for a reply that would appease; but, presently, said: "Oh! that's all right, Sir; there is something due on it."

"Mathematics for Engineers."

"Mathematics for Engineers" is the title of a work by W. N. Rose, which embraces all of the mathematics needed by engineers in practice and by students in all branches of engineering science. The work is in two volumes; the first carrying the studies through algebra, plane trigonometry, mensuration and graphs, the work being carefully graded from an elementary to an advanced stage. The second volume is devoted to the calculus and its applications, harmonics and vector analysis, spherical trigonometry, etc. Volume I contains 507 pages and is an excellent book for the telegraph and telephone engineer or student to possess, as the treatment of the subject of mathematics here worked out is from the engineer's standpoint.

The price of each volume is $6.00 and copies may be procured from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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MESSENGERS using HEAVY SERVICE TRACTION TREAD have a decided advantage over the rest of the force and experience fewer break-downs and delays.

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WESTERN UNION TELEGRAPH COMPANY.

S. J. GODDARD, recently appointed vice-president at London, England, is to be in charge of European commercial matters incident to the operation of the Western Union cable system. The vice-president in charge of the commercial department is to continue as heretofore to supervise cable system commercial operation in the United States, Canada and Newfoundland. The plant and engineering department of the cable system reports to the vice-president in charge of plant and engineering, New York. The traffic department of the cable system reports to the vice-president in charge of traffic, New York.

GENERAL MANAGER T. W. CARROLL is making a tour of inspection to cities in the Eastern Division.

H. W. DRAKE, apparatus engineer, New York, is on an official visit to Chicago, Louisville, and other terminal offices in the west and south. He is accompanied by A. Atherton of the engineering staff.

S. L. BURTS, division traffic superintendent, Southern Division, was a New York business visitor recently.

T. B. KINGSBURY, city superintendent, Philadelphia, was an official caller at headquarters recently.

M. J. GRADY, of the Omaha, Neb., office has been transferred to New York as chief clerk to Superintendent C. B. Horton.

H. E. ROBERTS of Vice-President Willever's office, who has been confined to his home for some weeks on account of illness, is reported as convalescing.

A. H. RICE, superintendent of telegraph, Delaware and Hudson Ry. Co., called on officials in the executive offices on March 24.

F. S. LEWIS, district commercial manager, New York City, has been granted leave of absence.

R. F. BLANCHARD has been appointed chief operator of the Houston, Tex., office, vice F. B. Witt, resigned.

A. E. JOHNSON has been appointed chief operator at White River Junction, Vermont, vice J. H. Maher transferred to Bangor, Maine.

New York Western Union.

H. H. FAWLES of the Chicago office died at Woodmere, L. I., on March 20.

W. Y. SEAMAN, a member of the operating staff for the past ten years, died March 5. The remains were taken to Denver, Colo., for burial. Mr. Seaman was identified with the telegraph service at Denver for over twenty years and was at one time editor of the *Rocky Mountin News.*

MARTIN DURIVAN has the sympathy of his numerous friends in the death of his two brothers which recently occurred within a short time of each other.

WILLIS H. JONES, of the engineering department has been confined to his home during the past month, due to illness.

THE TELEPHONE DEPARTMENT at No. 24 Walker Street now has about 300 employees. About 2,000 telegrams daily are handled through the recording and delivery section, and about 15,000 telegrams daily in the branch office section. Dorothy Budenbender is senior supervisor in charge of the telephone department. Mrs. Georgia Francis is supervisor of the branch office section.

THE EMPLOYMENT BUREAU at No. 24 Walker Street so far this year has interviewed 5,992 applicants for positions in Western Union service. Out of this number 513 of the applicants were selected for employment, the remaining 3,329 were rejected as unsuitable for the work.

MISS ETHEL CASSIDY of the Syracuse, N. Y. office is now in New York, at present being assigned to duty in the Commercial News Department.

THE FOLLOWING employees of the Salt Lake City, Utah, office are now in New York attending the demonstrations in the night multiplex school: Alice E. Scott, Aileen Roberts, Gladys Coombs, Cecilia Lofthouse, Eleanor Streadbeck, Eulah Z. Harlan and Elizabeth London.

O. A. HOFFMAN, manager of the Western Union Telegraph Company at Dickinson, N. D., has been elected Exalted Ruler of the Elks Lodge in his city. The Dickinson lodge is the largest in the state of North Dakota, now numbering seven hundred members.

JOSEPH DORAN, who for several years has been manager at Newport, R. I., has been appointed manager for the Western Union Company at New London, Conn.

A NEW BUILDING is to be constructed in Memphis, Tenn., to house the company's offices and operating department. The receiving department will be located on the ground floor, offices on the second floor and operating department on the third floor of the building.

Emergency Office Quickly Established.

At Holyoke, Mass., on March 9, a fire occurred which destroyed a part of Mount Holyoke College. The nearest telegraph office is the Holyoke main office, five miles from the college. On the day the fire occurred the weather was very disagreeable and there was a considerable amount of snow on the ground.

Manager Sayler, of the Western Union Telegraph Company, as soon as it was learned that the

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fire was beyond control, realized that a telegraph office close at hand should do a good business. Taking with him a clerk, Mr. Saylor walked the five miles to the college, hung out a Western Union sign near a telephone booth, and from there during the day sent out 159 telegrams and 4,000 words of press matter.

This big fire created an opportunity for a display of initiative. Manager Sayler promptly recognized the opportunity and made good.

This is the way men build up reputations which bring them promotion when changes in staff occur.

Western Union Lake Division.

JOHN F. WALLICK, formerly superintendent of the Western Union at Indianapolis and now retired, on March 2, celebrated his ninetieth birthday at his home in Indianapolis. Mr. Wallick retains his desk in the office and comes down every day for a part of the day at least. He is secretary and treasurer of the local Young Men's Christian Association and not merely an official in name only, but an active worker. His long years of residence in the community has brought him into touch with every class, and old and young, rich and poor alike united to do him honor and to extend to him their congratulations on the attainment of this ripe old age. Mr. Wallick's many friends in the telegraph service, all over the country, deluged him with messages and good wishes, and the Indianapolis office radiated good cheer on the festive occasion.

W. T. MCCLAIN was, on March 11, elected president of the Cincinnati, Ohio, Local of the Association of Western Union Employees, succeeding W. E. Flynn, resigned to assume the chairmanship of the grievance committee.

THE CINCINNATI employees have arranged for a return engagement of the play, "School Days," given by them some weeks ago.

CHARLES EDWIN MACHIR of Piqua, Ohio, died in that city on March 9. Mr. Machir was manager of the Piqua office during a period of about fifty-three years—from 1862 until his retirement four years ago. In the year 1862 Mr. Machir relieved the late Isaac McMichael as manager at Piqua, and in his long connection with the company became widely known as a capable manager, and as a helpful adviser to a large number of young men who took up telegraphy under his guidance and who made the telegraph business their life work.

H. M. NEWTON has been appointed commercial agent at Detroit, Mich. He was formerly manager of the Board of Trade office in Detroit.

OTTO SCHWANKE has been appointed manager of the Board of Trade "NE" branch office, Detroit, vice H. M. Newton.

FRANK B. BRADLEY, commercial manager, Detroit, Mich., who has been suffering from an attack of rheumatism, is reported on the road to recovery.

MISS EVA LA DOUSA, branch office manager, has been promoted to the cashier's department in the main office at Detroit.

RECENT APPOINTEES to branch office managerships in Detroit, Mich., include Miss Dorothy Ghent, Mrs. Helen Horton, Max Stoller, Edward Pascoe, and Max Busker.

MISS ROSE BOTWINIS, formerly employed in the office of the division plant superintendent, Chicago, has joined the commercial department forces at Detroit, Mich.

C. E. GRESHNER has been transferred from the Bellefontaine, Ohio, office to Coshocton, Ohio, vice J. H. Harlin, resigned.

W. J. DUGAN of Portsmouth, Ohio, has been appointed manager at Bellefontaine, Ohio.

W. G. BLISS has been appointed manager at Canton, Ohio, vice E. L. McQuiston, furloughed. Roy W. Schneider has been appointed manager at Lorain, Ohio.

C. D. PETERS has been appointed manager at Bedford, Ohio.

J. E. TIERNEY has been appointed manager at Kenton, Ohio, vice W. W. McPherson, deceased.

A CLASS ONE office has been opened at Orrville, Ohio, with Grant E. Long manager.

Dishonest Clerks.

Two young men clerks and a messenger boy in a Texas office of one of the telegraph companies recently tried out the get-rich-quick scheme of holding out tolls on "received collect" telegrams, with the usual disastrous results to themselves.

It is perhaps to be expected that with many thousands of telegraph offices doing business in this country, occasionally weak-minded or dishonest clerks will get into the service, and when this happens, opportunity soon presents whereby small amounts of money may be pilfered. The bookkeeping end of the business is so organized, however, that it is rarely that even the smallest shortage can exist for more than a few days before being discovered by cashiers, managers, or auditors.

In such times as the present, when there are many ways in which industrious young men may earn extra money honestly, and when a period of a year or two of conscientious performance of duty in the telegraph service invariably brings promotion, the wonder is that anyone with intelligence enough to be a telegraph clerk should resort to dishonest methods of procuring a few dollars.

The two clerks and the messenger boy referred to in the first paragraph herein were, in the course of a few days, caught in their illegal acts and turned over to a district court, which promptly meted out to them deserved punishment.

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Boston Western Union.

THE HUB is emerging from the covering of some 73 1-2 inches of snow, which deposited itself quite impartially all over eastern Massachusetts, but paid particular attention to greater Boston in the way of big drifts. Not a few members of the main office force resorted to snowshoes and skis in order to get to and from work during the past few weeks. Chief Operator John B. Rex and others of the Winthrop colony daily participated in Artic—like dashes acrosss the wild and frozen marshes which surround the island. Assistant Chief Operator T. J. Young, of the Commercial News Department, sustained injuries on one of the trips which resulted in the loss of the use of an arm for several weeks. Beachmont, so-called from its hilly streets overlooking the Atlantic Ocean, is a hard proposition to some of our night workers, who reside in that part of Revere. There is so much ice on the highways that the boys carry small bags of sand which is sprinkled before them as they walk up and down the glassy pavements. In spite of all the hardships of this remarkable winter there have been surprisingly few absentees, even on the days of the fiercest blizzard that ever struck this part of New England. Business has been very good all winter and seems to be on the increase. A large force is being used with the result that delays are kept at the minimum.

E. M. HEADLE has been transferred to the telephone department as acting night chief operator in charge.

H. J. ROUNDS has been appointed night automatic chief, with the following assistants: H. W. Verry; H. Odelsterner, F. L. Murray and H. O. Grey.

D. J. SHINE, supervisor, has been detailed on special duties.

IT WILL INTEREST many old-time Morse star telegraphers throughout the country to learn that Boston's famous receiver, Harry Waters, is still expert with pen or mill. W. T. Budds, and other high speed senders have often tried to find Mr. Waters' limit, but without success.

J. J. MULLIN is night chief operator of the main office, and Ted Smullin, force chief. James F. Madigan is early night wire chief, assisted by Gus Dunn.

EDWARD C. CORRIGAN, late night wire chief, assisted by W. A. Johnson, is in charge of the repeaters.

MISS BESSIE O'CONNELL, of the multiplex department, has the sympathy of the entire staff in the death of her sister Mary, who recently died at St. Mary's Convent, Jersey City, N. J. Mary O'Connell, at one time was one of our most popular Multiplex operators.

THE BOSTON OFFICE has perhaps a larger group of ambitious electrical students than any other office in the country. The men in both Morse and multiplex departments, are, in large numbers taking up the study of telegraph engineering. Soon we shall be able to supply experts wherever needed.

An Honest Clerk.

Edith Roth, route clerk in the service of the Western Union Telegraph Company in San Francisco, Calif., recently was handed a package of telegrams brought in by a messenger who had picked up the messages at a customer's office. As Miss Roth took the messages from the boy and carried them to the route desk she found among them a ten dollar bill. Without a moment's hesitation the young lady took the money to the chief operator for return to the owner. The presence in the service of employees of this type goes far toward compensating for the occasional lapses such as the McCarron case referred to on page 178 of the March 16 issue of TELEGRAPH AND TELEPHONE AGE.

Competent Telephone Clerk.

A firm of commission brokers having offices in Jacksonville, Fla., recently wrote the Western Union Telegraph Company, stating: "The lady clerk who takes telegrams by telephone in your office, has impressed us as one of the most pleasant, efficient and capable public service employees with whom we have business. You are fortunate in having employees of this kind."

As has been agreed upon many occasions: "The employee is the company."

CHARLES H. ERWIN, age 74 years, for many years, assistant superintendent of the Western Union Telegraph Company, New York, who retired from the telegraph service in 1902, died at Chicago on March 10. Mr. Erwin entered the telegraph business in Columbia, Pa., in 1861, and held many positions in various sections of the country until 1869 when he was appointed manager of the New York office of the Pacific and Atlantic Telegraph Company. In 1880 he was appointed assistant superintendent of the Western Union Telegraph Compay, with headquarters in New York, which position he held until his retirement from the telegraph service to devote his time to outside commercial interests. The remains were taken to Columbia, Pa., for interment.

MRS. RALPH W. POPE died at her home at Elizabeth, N. J., at 11 a. m., March 18, of apoplexy, after a month's illness. Mr. Pope is an old-time telegrapher, and was for many years secretary of the American Institute of Electrical Engineers, New York.

C. W. DAVIS, for many years employed in the Chicago office of the Western Union Telegraph Company, recently as supervisor, died in that city on February 22.

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Telegraph and Telephone Age

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"We Live by Mutual Consent."

Perhaps "agreement" would be a more acceptable word, but in these days it seems that unwritten law has about the same chance for observance as has the signed and sealed code.

We live by mutual consent, and as we go to press fifty thousand odd railroad men have in the most telling fashion at their command served notice on the rest of us that we shall live no longer by their consent.

One hundred million people are today, perhaps for the first time, seriously thinking out a way to deal with the menace.

So far, telegraphers have not deserted their posts, and this is to the lasting credit of the men themselves and to their leaders.

It is difficult for an old railroad man who worked with the trainmen and enginemen who operated the roads during the twenty-five years following the completion of most of the larger lines, to understand the present unrest. Prior to the year 1914, the difference between income and living expenses held a narrower margin than that difference holds today. Material comforts have vastly improved, and the opportunities for individual advancement are more plentiful now than in the past.

It may be that the Erie yardmaster is right who, the other day, remarked that, "In the old days we had wooden cars and steel men, while today we have steel cars and wooden men." But it gets us nowhere to make comparisons or to berate. The main outstanding fact is that a large number of the present citizens of the United States do not sense personal responsibility to their country or to their countrymen. Broadly, the only ethics observed is the ethics of the highwayman.

Farmer Smith puts his hard earned dollars in the village bank. The highwayman robs the bank without a thought of Farmer Smith. A score or so movie performers are paid a million dollars each per year. The railroad switchman reads about it and, ruminating, his own $2,500 per year at once appears to him as poor picking. But, note his reasoning: Instead of inquiring into the methods of the movie star, or of the man who has become superintendent of a division of railroad, he figures out a short cut to his heart's desire. It is not a new method, as it resembles very closely the method practiced by the highwayman in connection with Farmer Smith's money deposited in the village bank. In short, he proceeds to do all he can to starve ten thousand babies in Chicago or New York.

Two possible outcomes may be visualized: Either we are drifting toward military rule, directed by the majority of the people, or by mutual effort we shall have to devise a system whereby every man at every post in every industry in the country will in fact have his personal welfare identified with the welfare of the industry, the only reservations being that the affairs of separate industries shall be subject to the guidance of a National Department of Commerce responsible to the whole people.

Trained, conservative labor leaders who are in a position to hold the attention of the worker long enough to aid him in his reasoning have before them at the present moment a great opportunity. The welfare of the nation and the welfare of the citizens of the nation as a whole must be the first consideration.

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PRINTING TELEGRAPH SYSTEMS*

JOHN H. BELL
Telegraph Engineer, Western Electric Company, New York

THE object of this paper is to describe briefly those printing telegraph systems in use today which are designed for handling traffic at over 100 words per minute, and to discuss their operating features. This minimum speed limitation has been chosen as it effectively divides the various printing systems into two classes as regards traffic carrying capacity, each of which classes is of sufficient interest to warrant treatment in a separate paper. Practically all the printing telegraph systems not considered in this paper have a carrying capacity of from 50 to 70 words per minute, and are consequently in a class by themselves. The systems capable of carrying heavy traffic loads may be divided into two classes.

(1) High-speed systems.
(2) Multiplex systems.

By a high-speed system is meant a system in which the sending and recording machines operate at the same speed as the signals are transmitted.

By multiplex, is meant a system in which a plurality of sending machines and a plurality of receiving machines are directly connected in the telegraph circuit and individually operate at a lower speed than that at which the signals are being transmitted.

The systems to be discussed are as follows:

High-Speed Systems. Creed (continental Morse code) tape transmission. Signals received on perforated tape which is fed through a printer. Messages are printed on a tape.

Murray automatic (Baudot or five-unit code) tape transmission. Signals received on a perforated tape which is fed through a printer. Messages are printed in page form.

Siemens and Halske (Baudot or five-unit code) tape transmission. Signals received in printed form on a tape.

Multiplex Systems. Baudot (Baudot or five-unit code) direct keyboard transmission. Signals received in printed form on a tape.

American multiplex (Baudot or five-unit code) tape transmission. Signals received as printed message in page form.

Several years ago there was a diversity of opinion as to the relative merits of high-speed and multiplex systems, and the advantages of the five-unit code over other telegraph codes were not generally appreciated. The tape-transmitting, page-printing multiplex system using a five-unit code, however, has demonstrated its superiority over all others and one object of this paper is to indicate the reasons for this result.

* Presented at the 8th Midwinter Convention of the American Institute of Electrical Engineers, New York, February 19, 1920.

Perhaps the most elementary form of electric signaling is that in daily use by most executives, where one depression of a push button summons a messenger boy, two depressions means stenographer, and so on, a bell or buzzer being the telegraph instrument of call. To send the 26 letters of the alphabet in this fashion, where one beat represents *a*, two beats *b*, three beats *c*, and so on, would, obviously, be a tedious process. By arranging that some beats are short and some long and forming combinations of these short and long beats, a code can be built up. This is the basis of the Morse code. For actual telegraph purposes the push button is replaced by a suitable key and the bell or buzzer, by a sounder.

The sounder is an instrument which requires a considerable amount of energy to actuate it. Consequently, when a line exceeds a few miles in length it becomes economical to introduce for the reception of the signals, a more sensitive instrument than a sounder, namely, a relay, and to cause the sounder to be actuated locally. The relay alone is unsuitable because the noise produced is not sufficiently loud to be heard with distinctness at all times. With such a system, telegraph signaling can be carried on over several hundred miles provided the insulation of the line is good. Under wet weather conditions, however, the strength of the operating current at the receiving end of the line is reduced and the relay must be re-adjusted.

If, instead of a relay of the simple "neutral" type and a single-pole battery, there be used a polarized relay and a two-pole battery, the need for readjustment of the relay to meet variable insulation conditions is eliminated. The armature of the polar relay is acted upon in both directions. An impulse from the negative or "marking" battery causes the tongue of the polarized relay to make contact with its right hand or marking stop, while an impulse from the positive battery reverses its movement.

The positive or "spacing" battery takes the place of the retractile spring in the neutral or non-polar relay. As the current from both batteries is affected equally by variations in the line insulation, this is the equivalent of automatically varying the strength of the tension spring of a neutral relay to the exact degree of adjustment necessary.

Fig. 1 represents oscillograph records of signals transmitted over an artificial line simulating a 400-mile open-wire circuit. *A* shows the signals repeated by a polar relay, and *B* the signals repeated by a neutral relay when the insulation of the line was perfect. *C* and *D* show the repeated signals by the polar and neutral relays respectively, when the insulation resistance of the line is ap-

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proximately one quarter of its conductor resistance. No readjustment of the relays was made.

It will be seen that the repeated signals in the case of the polar relay are the same under the two conditions, while in the case of the neutral relay reduced current has produced "pin-pointed" dots. The superiority of the double current or polar method is evident.

A simple circuit of this type, when operated by hand Morse, provides for the transmission of one message at a time at a speed of approximately 30 words per minute. The next advance is to increase the carrying capacity of the circuit by transmitting two messages simultaneously—one in each direction. This was achieved by the invention of the duplex system.

By providing a polar relay having two equal windings, and an assembly of resistances and condensers to simulate the real line, at each end of the circuit, as shown in Fig. 2, signals may be transmitted from station *X* and repeated by the relay at station *Y* and signals from *Y* repeated by the relay at station *X* without interference with each other. The outgoing currents at each station divide equally at the common terminal of the home relay, the paths via the line and the artificial line having equal impedances. Passing through the two bal-

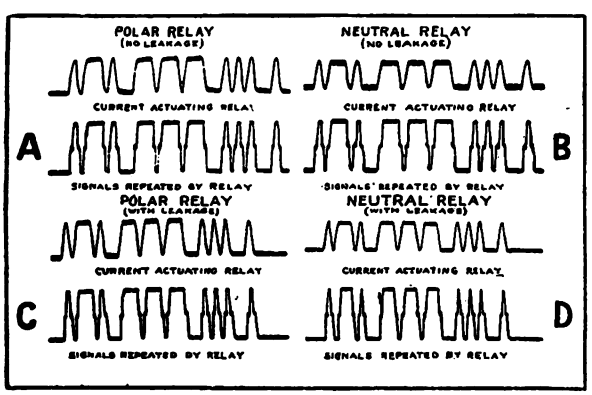

FIGURE 1.

anced windings of the home station relay in this manner they produce no effect on it. When the current reaches the distant station it passes through the line side winding of the relay and then divides between the two paths to ground, one via the transmitting key and battery, the other through the artificial line. That part of the current through the artificial line winding of the relay passes in the direction to assist the current through the line winding. The relay, therefore, is actuated in accordance with the polarity and duration of the incoming signals.

Except in the case of the longest duplex lines, it is possible to transmit signals at a speed much in excess of the fastest hand operation. In order, therefore, that a line shall be made to carry an increased load, an automatic transmitter for sending and a high-speed tape-recording instrument for reception, are used. Wheatstone designed such instruments in 1858 and these have undergone improvements from time to time, until today, they are capable of operation at a speed of over 400 words per minute. That is to say, the limit of speed of the apparatus is over 400 words per minute. The complete Wheatstone system comprises a perforator, an automatic transmitter and a tape recorder. The original type of perforator has three keys which are struck by small mallets held in the hand.

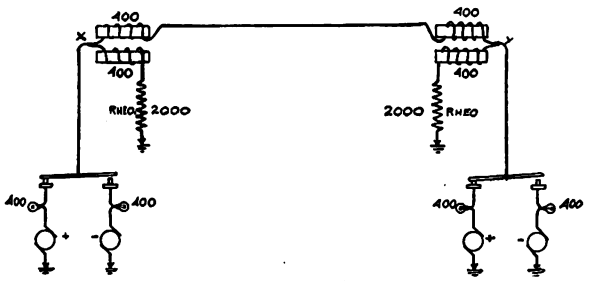

FIGURE 2.

The left hand or dot key perforates two signal holes and a center feed hole in vertical alignment across the tape. The middle or space key perforates a center feed hole, and the right hand or dash key perforates four holes, two being signal holes and two being feed holes. This type of perforator is rapidly being replaced, however, by modern keyboard perforators of which the Kleinschmidt is probably the best known.

In Fig. 3, *X* shows a piece of tape with the letters *A, B, C, D* perforated.

The automatic transmitter for operation in conjunction with this tape, (Fig. 4) has two vertical selecting pins, each pivoted to a bell crank lever *B C L*. The two bell crank levers control the movements of the contact-making arm *C M A* by means of the push bars, each of which has a collar or flange *C*. Each push bar extends beyond the collar, through a hole in the contact lever which acts as a guide or sliding support for that end of the push bar. When pushed beyond the dead center of the jockey roller, *J R*, the jockey roller insures firm contact being made and also retains the contact lever in the position placed while one push bar is being withdrawn and the other advanced.

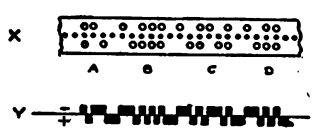

FIGURE 3.

The upward movement of the selecting pins *S S P* and *M S P* is controlled by the rocking arm *R A* and by the perforations in the tape. Power is transmitted to the rocking arm *R A* and the sprocket feed wheel *S F W* from an electric motor and these units of the driving mechanism are so geared that the marking selecting pin *M S P* rises so as to strike the tape exactly opposite a feed hole. When

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no signal hole occurs the selecting pin is not free to rise, consequently, the contact-making arm remains in the spacing position.

When a signal hole does occur the "marking" selector pin *M S P* passes through it, and the push bar is forced to the right by the tension spring *T S*. As the feed wheel rotates, moving the tape along, the rocking arm releases the spacing selecting pin *S S P* and withdraws the marking selector pin *M S P*. The upper end of the spacing selector pin is so guided as to engage with the signal hole in the lower row on the tape. When a signal hole occurs, the spacing selector pin passes through it and the lower push bar *P B* moves to the right causing the lever *C M A* to make contact with the positive battery contact point.

In the case of a dash or a space, both selector pins are prevented from rising once owing to the absence of signal holes. During these periods, the contact-making arm remains at rest.

During a dash it rests against the negative battery contact and during a space against the positive battery contact. The signals passing to the line are shown at *Y* in Fig. 3.

For a speed of 120 words per minute each selecting pin is freed to rise through the perforations in the paper tape at the rate of 54 times per second, the rest of the mechanism operating at a like rate. Obviously, the adjustments in such a machine must be extremely accurate.

This method of transmission is used in the Creed printing system which was designed to supplement the Wheatstone system and thereby to effect labor economies and reduction of delay at the receiving end, two features in which the Wheatstone system compares unfavorably with printing systems.

Creed System

This system has been in commercial use in England and several other countries for the last 12 years. Actually it may be described as a development of the Wheatstone system. So far as the sending station is concerned there is no change from the apparatus and method of operation used in the Wheatstone. The messages are first handled by operators at keyboard perforators who prepare them in the form of perforated tapes. These operators are generally seated close to the transmitter, and as they complete each length of tape containing two or three messages, pass it forward to an operator who feeds the tape into the Wheatstone transmitter.

At the receiving station the incoming signals are made to actuate a "receiving perforator" which reproduces a perforated tape identical in all respects to that which is fed into the Wheatstone transmitter at the sending station. This perforated tape is then fed into an automatic printer which prints the message in bold Roman characters on a paper tape.

The general practice is to have the receiving perforator and printer mounted conveniently near each other so that the perforated tape is fed into the printer with minimum delay.

As the printed tape comes from the printer it is fed through a small gumming device, or if gummed tape be used, over a moistening roller, thence to the gumming operator. The duty of this operator is to paste the tape neatly on the standard telegraph blanks. Where the speed is low, such as on circuits feeding or fed by a submarine cable, this operator checks the messages as well, but on circuits operated at 100 words per minute the gumming operator is able to perform only the work of pasting; the checking being done by a second operator. This system is an improvement over the Wheatstone system in that it eliminates the laborious process of tape translation.

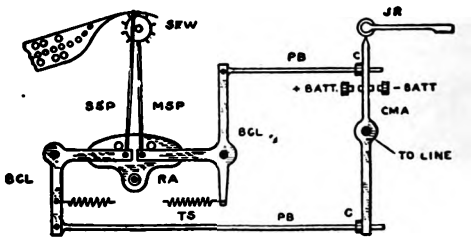

Figure 4.

Receiving Perforator. Fig. 5 shows in diagrammatic form the construction of the Creed receiving perforator which reproduces a perforated tape identical with that fed into a Wheatstone transmitter at the distant end of the line.

A represents a polarized relay of the British post office type. No electrical contacts are used, and in place of the contact-making tongue, a light tongue *R T*, having a small slide valve *S V*, at its

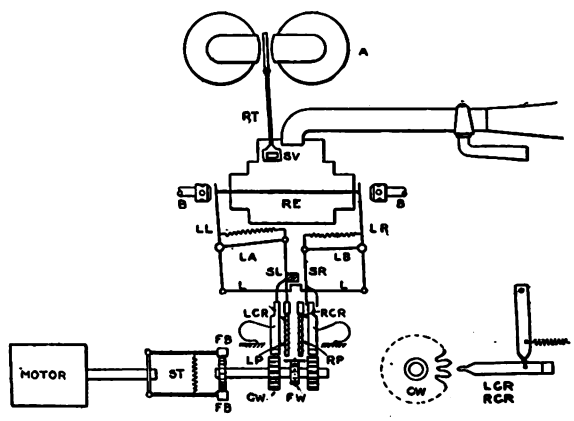

Figure 5.

free end, is provided. Movements of this valve *S V* control a supply of compressed air to the small relay engine *R E*, causing its piston to move from side to side. The rod of this piston carries two circular disks which act as valves controlling the air inlets to a larger double-acting piston (Fig. 6). This larger piston has a rod projecting from each side of it, the rods projecting through the cylinder cover, and acting upon the bell crank levers *L L* and *L R*, (Fig. 5). The adjustable buffers *B* regulate the travel of the piston and piston valves. The

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arms *L A* and *L B* transmit the movement to the striker arms *S L* and *S R*, the free ends of which are bifurcated for the purpose of thrusting against the punches *L P* and *R P* and corrector rods *L C R* and *R C R*. The punches and corrector rods are mounted and guided in a separate block which also carries the die-plates, feed wheel, and corrector wheels The ends of the corrector rods have flattened pointed ends which enter between the teeth of the corrector wheels. The punches and correctors are the parts most subject to wear and this arrangement provides for the quick replacement of the punch block, there being generally two such blocks provided with each machine. Springs are provided for restoring the punches and corrector rods as shown in Fig. 5.

The paper tape which is previously center-holed is fed up between the die-plates past the punches and engages with the small sprockets of the feed wheel *F W*. The feed wheel and correcting wheels *C W* are firmly mounted on the same spindle which is rotated by an electric motor. The corrector rods

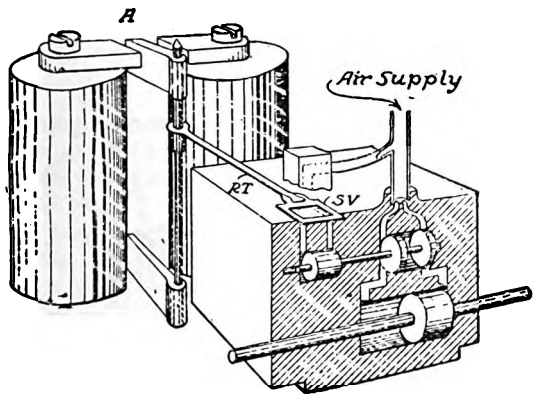

FIGURE 6.

move in advance of the punches and hold the corrector wheels and the feed wheel in the correct position so that the perforations made by the punches shall be in correct vertical alignment with the feed holes. This insures that the perforated tape will properly actuate the printer. As the tape is momentarily stopped at the instant of perforating, a friction drive is introduced between the motor and the feed-wheel spindle. The exact degree of tension is secured by regulating the position of the spring *S T* along the two rods carrying the friction clocks *F B*.

Connecting the ends of the bell crank levers *L L* and *L R*, is a link *L* on which is a tappet-piece which pushes on the striker bars laterally, and causes them to slide clear of the corrector rods and punches at the right moment.

As the two signal holes forming a dot must be in vertical alignment with their corresponding feed hole on the tape and a small interval of time elapses between the two perforating operations, during which time the tape has traveled a little, the right-hand correcting wheel and the right-hand punch are given a lead equal to one-half tooth of the corrector wheel.

Air pressure at approximately 30 lb. per square inch is required to operate the air engine.

The speed at which the paper tape is fed forward may vary within fairly wide limits as the correcting rods will advance or retard it at every signal. On one occasion the writer has witnessed the machine perforating correctly at 140 words per minute while the tape speed was adjusted for 100 words per minute.

When receiving reversals at 120 words per minute, this machine perforates 108 holes in succession per second.

Printer. The perforated tape is next fed through the Creed printer, which reproduces the message in Roman characters on a paper tape, suitable for pasting to a telegraph form. The received perforated tape can be run through the printer several times and, in addition, it can be utilized to re-transmit the signals to any other line or lines equipped with Wheatstone apparatus. Pneumatic pressure is used for the printing and a small electric motor supplies the necessary power to drive the camshaft.

The perforated tape is fed forward, letter by letter, in a guideway, in front of a series of ten pairs of selecting needles, one needle of each pair being associated with one of a series of ten slide valves. These valve plates, made of thin sheet steel, can be made to occupy one of two positions, selected and non-selected, so that a number of different combinations can be set up. Each valve plate has a number of holes or perforations in it and when a combination has been set up, a passage exists through the ten valve plates to one of the small cylinders in the cylinder box. Compressed air can thus be admitted forcing up the small piston which acts on the end of a lever connected to one of the type bars.

A diagrammatic sketch of the printer is shown in Fig. 7. The perforated tape is fed by means of a sprocket feed wheel between two vertical guide plates which have ten pairs of holes positioned to permit of the entry of the ten pairs of selecting needles. Should the perforated tape have a continuous series of dots all the selecting needles would have entry. Particular combinations of perforation in the tape will permit only certain of the selecting needles to enter, and it is by this means, that the spacing and letter selections are made. The feed wheel is mounted on the same spindle as the toothed wheel which is rotated by the vertical feed rack actuated by a cam on the main shaft. An examination of the perforated tape, Fig. 3, will show that between each letter combination there is a clear blank space which would block the entrance of one pair of selecting needles in the same horizontal plane also that the lower row of signal holes alone is sufficient to differentiate between the various letters, figures and punctuation marks, provided that the spacing between the letters is recognized. These are the two underlying features upon which the selecting mechanism of the printer is designed.

If a space occurs in the tape neither of the pair of selecting needles opposite this position will find

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entry through the guide plates, and will consequently permit the space lever which they control to remain in position to block the downward movement of the feed rack. If a space position occurs opposite, say, the sixth pair of needles, the rack will move down to that position so that on its upward movement it will cause the toothed wheel and feed wheel to rotate and carry forward the tape an equal distance. If the space occurs opposite the second pair of needles, which would be the case for the letter *e*, then the tape is fed upwards two space holes.

If one or both of the needles of a horizontal pair finds entry through perforations in the tape, the space lever is moved clear of the feed rack.

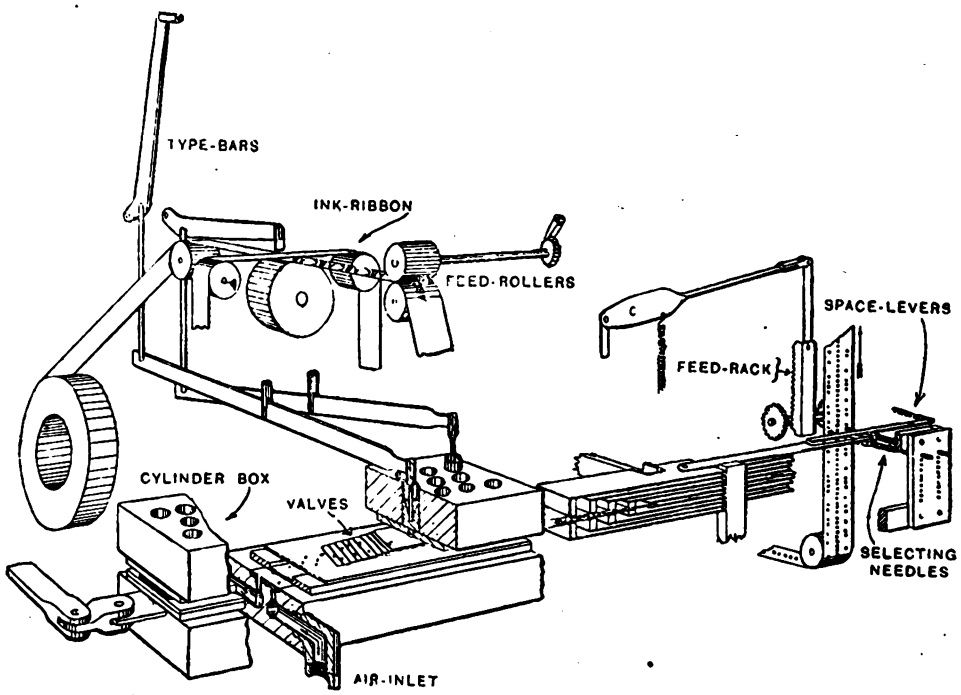

FIGURE 7.

The valve selecting levers are controlled by the selecting needles which engage with the lower row of signal perforations only. When one of these levers is pushed forward by a selecting needle, it is in position to be moved laterally by the rack which has a lateral motion imparted to it at the right moment by a cam.

Although selecting needles below a space position enter the signal holes of the next or part of the next letter combination on the tape, and carry with them the valve selecting levers, these levers are not acted upon by the rack because it does not descend so far.

Consequently, only those selected levers above the space position are moved to the left and they carry with them the slide valves to which they are fixed.

As soon as the slide valves have been moved they are compressed between the two stout plates forming the slide-valve chamber. The main air valve is then opened by cam action, admitting compressed air to the slide-valve chamber, whence it finds passage through the ten valve plates by the one hole made available by the particular valve setting, and forces up the small piston which actuates the corresponding type lever.

The slide-valve chamber is then opened, and the valves are returned to normal position. Meanwhile the paper-lifting rack is drawn up by cam action and in its upward movement it engages the toothed wheel so that the paper tape is drawn up the proper distance for the selection of the next letter. The path of movement of the rack forms a narrow rectangle, the length of which is determined by the length of space occupied on the tape by the letter combination printed.

It will be seen that the differential feed of the tape involves a selecting mechanism which is not required in the case of systems using an equal unit code, which are described later.

This printer has been operated in laboratory tests up to 130 words per minute, but for commercial use it is found best to work it at a speed not exceeding 100 words per minute.

The air pressure required is the same as for the perforator.

MURRAY AUTOMATIC SYSTEM

The Murray automatic system is not widely used, but where it has been installed it has rendered good service.

At the transmitting station the method of operation closely resembles the Creed. A number of operators perpare the messages on paper tapes by means of keyboard perforators. This tape has feed holes identical with those on the Wheatstone tape, but with signal holes in alignment with the feed

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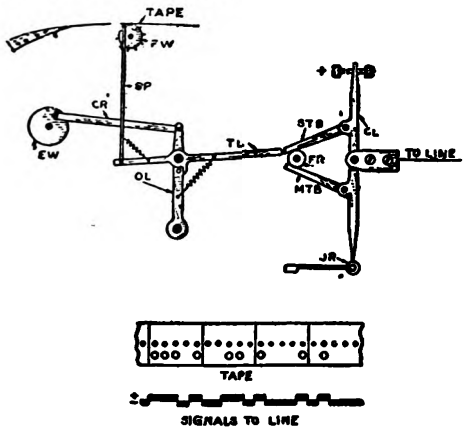
holes, on the lower side only. The perforated tapes are passed to the transmitter operator who feeds them into the transmitter.

At the receiving station the messages are received on a receiving perforator which produces a perforated tape identical with that fed into the transmitter at the sending station. This tape is then passed into an automatic printer which prints



FIGURES 8 AND 9.

the messages in page form ready for delivery. In addition to the advantage of the shorter code used this system eliminates the gumming process as used in the Creed.

Fig. 9 shows the appearance of Murray automatic tape. In this case, every letter and symbol occupy the same length of tape (one-half inch) so that a differential tape feed feature is eliminated in the perforator, the tape being fed forward through the perforator, letter by letter. Only five punches are needed, all combinations being formed by various groupings of these.

The vertical marks on the tape after every fifth hole are for the purpose of enabling the operators to read the signals.

The transmitter is driven by a phonic wheel motor which is controlled by a vibrating reed. The unloaded reed is designed to vibrate at a certain speed and by loading it with weights, which can be fixed at any position along the reed, the speed can be reduced. The speed of the transmitter can be adjusted by this means over a considerable range.

In the Murray automatic transmitter (Fig. 8) only one selecting pin *S P* is needed. The tape feed wheel *F W* is coupled direct to the phonic wheel motor while the eccentric wheel *E W* is geared to rotate at ten times the speed of the feed wheel, that is, once for each sprocket of the feed wheel. For each rotation of the eccentric wheel *E W*, the oscillating lever *O L* makes one complete movement, carrying with it the thrust lever *T L*. If there be no signal hole in the tape, the selecting pin *S P* does not rise so that the thrust lever *T L* strikes the upper or spacing thrust bar *S T B* and carries it past the dead center point of the jockey roller *J R*. The contact lever *C L*, therefore, makes contact with the right-hand battery contact point.

At the next step of the feed wheel *F W* the eccentric wheel *E W* makes another complete revolution and the thrust lever *T L* again moves to the right. If no signal hole exists movement of the thrust lever *T L* will be identical with its previous movement. The contact lever, however, remains in the position set by the previous thrust, due to the jockey roller *J R*.

If the next step of the feed wheel brings a signal hole in line with the selecting pin *S P* the thrust lever *T L* will be tilted downward and will strike the lower or marking thrust bar *M T B* and cause the contact lever to make contact with the other pole of the battery.

With this transmitter operating at a speed of 120 words per minute the pin selecting mechanism is required to operate at the rate of 60 times per second, that is, the eccentric wheel *E W* makes 60 revolutions and the thrust lever oscillates 60 times per second.

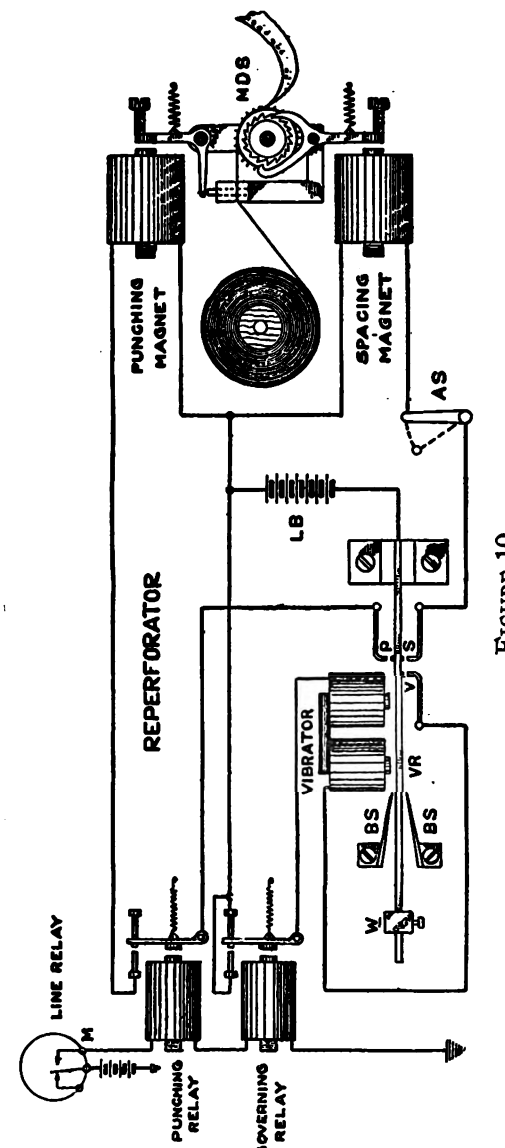


FIGURE 10.

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Murray Automatic Receiving Perforator. The circuit arrangements of the Murray receiving perforator are shown in Fig. 10.

The vibrating reed *V R* is provided with a weight *W* fixed at some point along the reed so that the rate of vibration of the reed will be slightly faster than twice the frequency of the incoming signals. The reed is kept in constant vibration by means of the local battery *L B*, the circuit being via the contact *V*, the vibrating magnet and the back or front contact of the governing relay. The amplitude of vibration is limited by the buffer springs *B S*. If the amount of energy acting upon the reed be increased, the rate of vibration increases. Conversely, if the amount of energy be reduced, the rate of vibration is reduced. The punching and governing relays are connected in series from the *M* or marking contact of the line relay. The punching magnet is operated when the tongue of the punching relay is pulled up and the contact *P* on the reed is closed. Consequently, if the tongue of the line relay remains in the marking position the punching magnet will be operated each time the vibration of the reed closes the contact *P*. The spacing magnet is operated when the *S* contact of the reed is closed. If no signals are passing the spacing magnet continues to feed forward the tape, but after about a foot of blank tape has passed an automatic switch *A S*—a small mechanical device—opens the circuit of the spacing magnet *S M* and the tape is stopped. The first marking signal closes this switch and it remains closed so long as signals are passing. The actuation of the spacing magnet operates the escapement mechanism on the motor drive shaft *M D S*. It will be obvious that the punching and spacing magnets work alternately, the tape being fed forward when the punch has been withdrawn.

Speed Control of Reed. The frequency of the reed is adjusted to be about 2 per cent or 3 per cent faster than twice that of the incoming signals and this frequency will be maintained so long as the tongue of the governing relay is stationary or moves from one contact to the other at the same instant that the *V* contact on the reed is closed.

Actually, the incoming signals cause the governing relay to be operated slightly out of phase with the closing of the contact *V* on the reed, so that the amount of energy passing through the vibrating magnet is reduced until the contacts are again simultaneous. Consequently, the frequency of the reed is reduced momentarily. When signals are passing, speed correction of the reed by this means may take place about two or three times per letter signals if such be necessary, but generally the speed of the reed is such that one correction per six or seven letters is sufficient to maintain unison.

Printer. The latest type of Murray high speed printer comprises six horizontal slotted combs, five of which have a selecting needle fitted on one end for engaging with perforations in the tape. The sixth comb has no selective needle. Mounted in front of the slotted combs is a series of vertical selecting bars. A small electric motor drives the main shaft which extends across the whole length of the base and all movements are controlled by a series of cams mounted on this shaft.

The tape is fed round a wheel which acts both as a feed wheel and a guide for the selecting needles.

The type bars are only 2 inches in length and in order to have them all strike at the same position on the platen they are mounted in a circle. Connecting rods are led down from the typebars to a series of hooks one of which is positioned in front of each vertical selecting bar.

The tape wheel is advanced against the selecting needles so that those which find a blank in the tape are pushed to the left leaving the selected needles with their slotted combs in place. The next movement in the cycle of operation is the withdrawal of the restoring bar permitting all vertical bars to move forward, but only one vertical bar finds a free path to move, the others being stopped by the blank portions of the slotted combs. The bar so selected, pushes forward the hook immediately in front of it, placing it in the path of the striker bar.

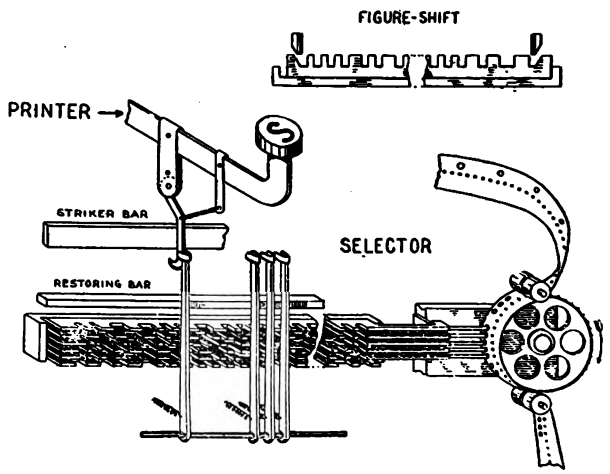

FIGURE 11

As soon as the striker bar comes down and engages with the hook the restoring bar pushes back the vertical selecting bar so that the setting up of the next letter combination may be proceeded with. This overlapping of the cycle of operation is a distinct advantage permitting a slower operation of moving parts and consequently less wear and tear.

With five slotted combs only 31 combinations can be made, but by adding a sixth comb, which can occupy one of two positions, the number of selections can be doubled. Only 56 selections, however, are required. The sixth bar is moved when the "figure shift" signal occurs in the tape. The vertical bar selected by this signal combination causes the sixth slotted comb to slide in the same way as do the five selecting combs and in this position all the vertical selector bars associated with lower case characters are rendered non-selectable while the vertical bars associated with the upper case characters may now be selected. The "letter shift" signal restores the sixth slotted comb to normal.

Fig. 11 shows the selecting mechanism of the

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old Murray automatic printer, which does not differ fundamentally from that of the new high speed printer. In the new machine, however, typewriter keys are not provided.

Siemens & Halske High Speed System

The Siemens and Halske is another type of high-speed system.

At the sending end the operations are practically identical with those of the Creed and Murray automatic in having several perforating operators and one transmitting operator.

At the receiving station the perforated tape is eliminated, the messages being printed on a tape direct from the line signals. This tape is pasted on the message blanks.

This system shows a further development in that intermediate process of perforating a tape at the receiving station is eliminated, but the gumming process is continued.

Fig. 12 shows the high-speed transmitter used in the Siemens and Halske printer system. The tape in this system is perforated on a keyboard perforator. The five-unit code is used, so that a maximum of five perforations is required per letter combination. The tape, however, differs from the Murray automatic tape in this respect, the signal perforations are made across the tape instead of along it, so that a space of only 0.1 in. per letter is required, a wider tape being used.

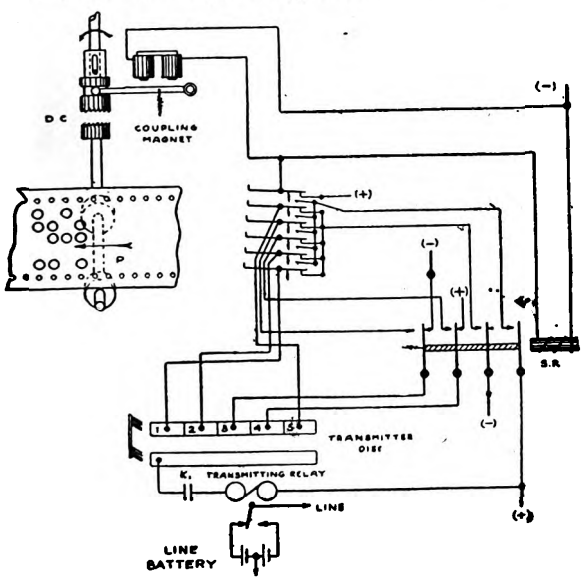

Figure 12

With this form of perforated tape the transmitting mechanism must include means for securing the proper sequence of signals. This is achieved by using a rotating distributor which consists of two metal rings over which contact brushes pass at the rate of one revolution per letter. One ring is solid, the other is divided into five equal segments.

Fig. 12 shows the general arrangement of the transmitting circuits. The perforated tape has two rows of feed holes for ensuring its accurate movement over the six contact fingers which are located below the tape. When blank tape is being fed through the transmitter the centrally pivoted fingers are held down by the tape so that they rest against their upper contact stops.

When no tape is in the transmitters all fingers are free to rise, and the sixth or top finger then closes a circuit through the coupling magnet and the switching relay *S R*. Actuation of the coupling magnet withdraws the clutch *D C*, thereby stopping the transmitter. The function of the switching relay will be referred to later.

In rising, the five selecting fingers which engage with the signal perforation in the tape, make contact with their lower stops. The upper contact stops are connected to the positive pole of the local transmitting battery and the lower stops to its negative pole. The five selecting fingers are connected to the five segments of the transmitting ring. The selecting fingers are not in lateral alignment; the second finger is 0.020 in. to the left of No. 1, No. 3 is 0.020 in. to the left of No. 2 and so on, so that as the tape is drawn over them they engage with the perforations in sequence and No. 1 engages immediately after No. 5 has engaged with a perforation of the preceding lateral group of perforations. The distributor brushes are so geared that at the moment finger No. 1 engages with a perforation the brushes start to sweep over segment 1; when finger No. 2 engages with a perforation the brushes start to sweep over segment 2 and so on. The solid ring which is in connection with the segmented ring through the rotating brushes is connected through a condenser to the transmitting relay. Consequently, when a perforated tape is inserted and the selecting fingers are set up in different combinations positive and negative impulses will pass through the transmitting relay and actuate it.

When no tape is in the transmitter the transmitting relay would remain at rest, sending out either a steady positive or negative current. As the system is a synchronous one and the maintenance of synchronism between the two ends of the line is dependent upon the reception of signals, provision is made for sending a signal once per revolution in the following manner:

The switching relay is actuated when there is no tape in the transmitter, as has already been described. The actuation of this switch removes the normal battery connection to the selecting fingers and connects negative battery direct to segment 3 and positive battery to segment 4 of the distributor. Consequently, the transmitting relay will send out a reversed pulse each time the brush sweeps over segment 3.

(*To be continued May* 1.)

In Guatemala a telegraph line is being constructed from San Joaquin to La Reforma, via La Conquista, a town of the Department of San Marcos.

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THE STORY OF THE TELEGRAPH

Including

SUBMARINE CABLES AND RADIO TELEGRAPHY

(*Continued from March 16 issue.*)

DROPPING for a moment the story of land line telegraphs it may be well to revert to the account of the extension of submarine cables which followed the laying of the first successful Trans-Atlantic cable in the year 1866, previously referred to.

Telegraphic connection between Europe and America was not long left dependent upon the two strands which joined the two continents in the year 1866. Additional cables were laid in the years 1873, 1874, 1880, and 1894; the main sections extending between Ireland and Newfoundland.

The 1874 cable was the last cable-laying enterprise in which the famous ship *Great Eastern* was employed.

In 1869, and in 1879 cables were laid between the coast of France and America.

The Commercial Cable Company laid two cables acrosss the Atlantic in 1884, one in 1894, one in 1905, and one in the year 1901.

Two submarine cables were laid between Germany and the United States, one in 1900, and the other in 1904.

At the present time there are eighteen cables in operation.

It was not until the year 1903 that the Pacific Ocean was spanned by a submarine cable. In that year an all-British cable was laid from a port in the province of British Columbia, Canada, to Australia. Also, in the year 1903, the Commercial Cable Company laid an all-American cable between San Francisco and the Philippine Islands. In 1906 this cable was extended to Japan and China.

In the year 1866, a cable was laid between Punta Rassa, Florida, and Havana, Cuba, and in the year 1880, a cable between Galveston, Texas, and Vera Cruz, Mexico. Connection was made with South America in the year 1882 by means of a cable laid between New York, and Colon, Panama, thence across the isthmus and along the west coast of South America. Since that time duplicate cables have been laid along all main routes.

At this writing there are 290,000 miles of submarine cable in use, having been laid at a cost of $300,000,000, and in the waters of the globe forty-six cable steamers are employed in the task of repairing and maintaining these submarine lines.

Wireless.

As an announcement that sending four telegrams over one wire simultaneously, or hooking up two typewriters by a wire five hundred miles long, was not to be the ultimate of telegraphic achievement, in the year 1896, news despatches came over the cable from London that an Italian youth named Marconi had arrived in England with apparatus of his invention which made possible the sending of telegrams over short distances without the need of intervening wires.

In the years immediately following 1896, speculation was rife the world over as to whether or not connecting wires and submarine cables were doomed. Although wireless telegraphy has made great strides since 1896, it is apparent that it has developed a field of its own,—a field of great and ever expanding usefulness, but, on the other hand, it is a fact that additional land wires are still being erected and additional submarine cables being laid.

Wireless telegraphy may truthfully be said to have had its beginning when Clerk Maxwell, the great English physicist, about the year 1864 announced his mathematical deductions relating to the electro-magnetic theory of light.

In the year 1888, Heinrich Hertz, in Germany, reaped the harvest by experimentally proving Maxwell's theories, and announcing a method of producing controllable electro-magnetic vibrations.

In 1891, Branly, in France, discovered a practical method of detecting Hertz' waves at any point in space, and in the year 1894, Oliver Lodge, in England, constructed and exhibited various forms of the Branly detector in action.

In Italy, in the year 1895, Marconi experimented with the devices of Hertz and Branly, and constructed apparatus capable of telegraphing over short distances without the use of connecting wires.

In 1896, Marconi, through the cooperation of Mr. W. H. Preece, chief electrical engineer of the British Post-Office Telegraphs, transmitted signals over a distance of one and three-fourths miles on Salisbury Plain.

In March, 1897, a distance of four miles on Salisbury Plain was covered. On May thirteenth of that year communication was established between Lavernock Point and Brean Down, a distance of eight miles.

In America (1890-1897), many students of science were in touch with the discoveries being made in Europe, and it was during the latter year that the utilitarian American mind first sensed the commercial possibilities of the newly discovered method of transmitting telegraphic signals.

In September, 1899, during the International Yacht Races off New York harbor, the steamer *Ponce* was equipped with radio apparatus by Marconi, for the purpose of transmitting reports of the progress of the race. Two receiving stations were equipped; one on the Commercial Cable Company's cable ship *Mackay-Bennett*, stationed near Sandy

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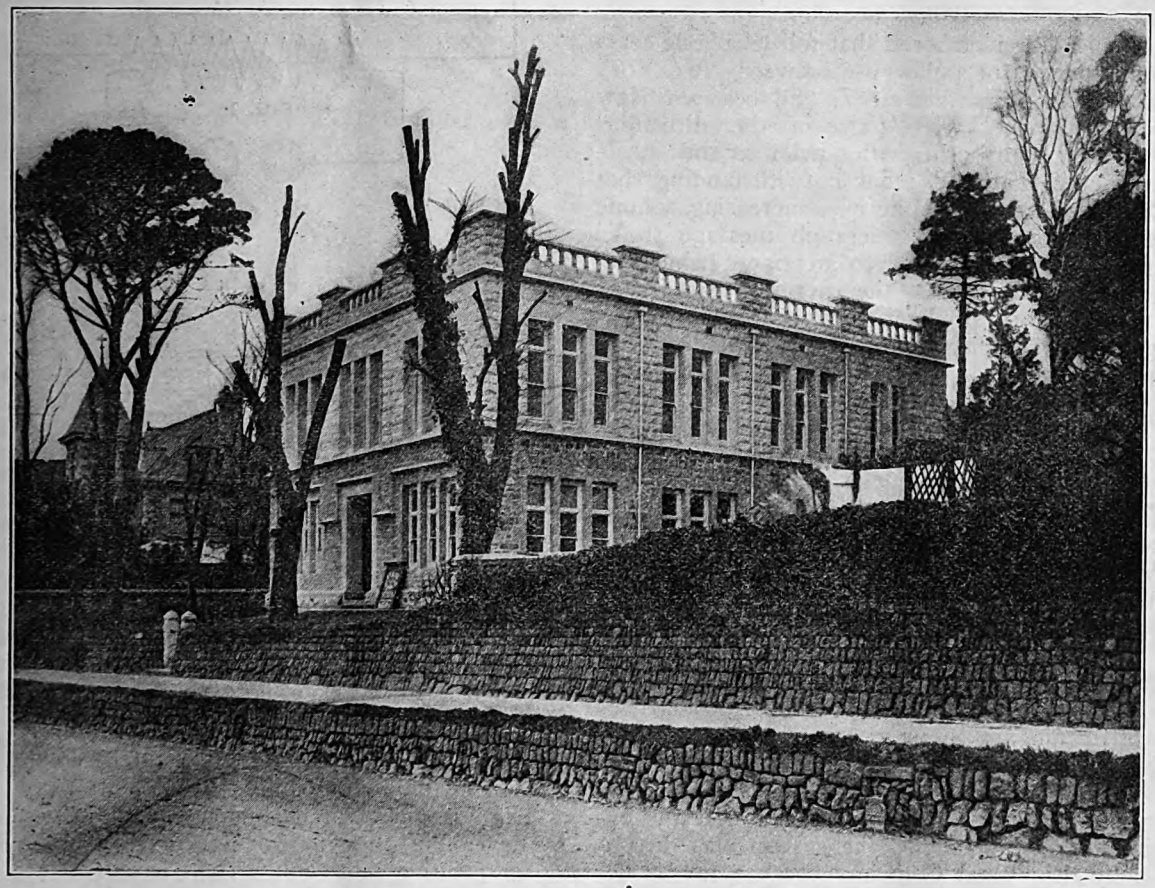
Hook, and connected with a land line station on shore by means of a regulation submarine cable; the other at Navesink Highlands. This demonstration, although not highly successful, brought the subject to the fore in this country.

In the year 1900, the first Marconi station at Cape Cod, Mass., was built, and a year later the station at Siasconset was completed. The intention was to communicate with ships at sea, later to be equipped with radio apparatus.

The radio crowning event of the year 1901 was the reception by Mr. Marconi, at St. John's, Newfoundland, of the letter "S" transmitted as a test signal from his English station; this was on December 21, 1901.

However, as was the experience with land line telegraphy, all of these companies which had tangible assets, ultimately consolidated with the Marconi Company,—the major concern, and by the year 1912 the business had become a commercial reality. High power coastal stations have been erected which now are capable of spanning the Atlantic and the Pacific oceans.

In the year 1913, Mr. Edward J. Nally, who had been Vice-President and General Manager of the Postal Telegraph-Cable Company, became General Manager of the American Marconi Company, and from that time onward the management and operation of the radio system passed into the hands of thoroughly trained telegraph executives.



Submarine Cable Station, Penzance, England.

Beginning in the year 1902, many improvements in radio apparatus were made by American inventors; notably, Dr. Lee De Forest, Prof. R. A. Fessenden, Nikola Tesla, John Stone Stone, and W. W. Massie.

When first introduced commercially in this country radio telegraphy was exploited by a number of separate operating and manufacturing companies, and during the first seven or eight years the practices of stock jobbing and of organizing fake companies retarded the development of the new system.

Land Lines.

In conclusion we shall take up the story of land line telegraphy where we left off in the year 1883, at the time the re-organized Postal Telegraph-Cable Company entered the field in earnest, under the aggressive management of the late John W. Mackay.

One of the most common remarks made in uninformed circles in reference to the state of the art of telegraphy at the present time, is that the telegraph stands today where Morse and his immediate successors left it fifty years ago. Nothing

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could be further from the truth than this. In fact, it may safely be said that nothing remains of Morse's original work except the sending key and the symbol code, or alphabet. Even the key has during the past fifteen years been used only to a limited extent.

Numerous technical improvements have been made in the design of, and arrangement of apparatus, and the fact that today eighty telegrams per hour are handled over a single outlet, where fifteen years ago half that number in the same time was regarded as good performance, and that during the same period the time of transmission of a telegram between cities remotely separated has been reduced at least one-half, cannot but be admitted as convincing evidence that vast improvement has taken place.

It should be remembered that toll telephone service was opened for public use between New York and Boston in the year 1887, and between New York and Chicago in 1892; also in other directions and between many other cities prior to and subsequent to the year 1887; but notwithstanding that the telephone has carried an ever increasing volume of long distance traffic, telegraph message traffic has continuously increased to an extent which today taxes to the utmost the carrying capacity of the vast network of lines joining together every village, town, and city of importance in the country.

After the disappearance of the House, Hughes, and Phelps printing telegraph systems in the early days of telegraphy, ordinary Morse operation,—with a few scattered Wheatstone circuits—held the field during a period of thirty years.

In the year 1907, the Barclay-Buckingham printing telegraph system was introduced on the lines of the Western Union Telegraph Company, and for a number of years thereafter was quite extensively employed.

In the same year, the Postal Telegraph Company experimented with the printing telegraph inventions of Prof. W. A. Rowland. The Rowland was a beautiful and ingenious system capable of transmitting eight telegrams simultaneously over a single wire; the received message being reproduced in type-written characters in page form. At the expiration of a year or two the system was discontinued by the Postal Company because it was decided that the system did not ideally meet existing traffic conditions.

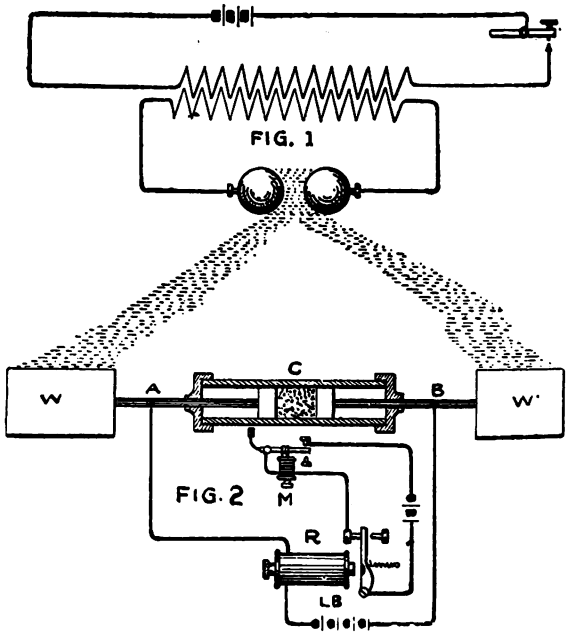
Then followed the printer invented by John E. Wright, an old associate of Mr. Edison. The Wright printer permitted the transmission of one message in each direction over a single wire simultaneously. Mechanical difficulties and frequent circuit failures resulted in the printer being returned to the shops for further development, about the year 1911. It has not since reappeared in commercial service.

In 1910, Messrs. Krum and Morton introduced a comparatively simple duplex printer system, known as the Morkrum, and which at the present time is quite extensively employed on both commercial and railroad telegraph lines.

In the year 1909, the American Telegraph and Telephone Company, purchased a controlling interest in the Western Union Telegraph Company, with the object of effecting economies which it was thought would ensue from the complementary operation of the lines owned by each company.

The combination lasted until January, 1914, when it was dissolved on account of government objection to the continued joint operation of what were considered competing wire systems.

The introduction of "night letter" and "day-letter" telegraph service in the year 1911, although quite an innovation in this country, very soon yielded an increase in wire traffic which seriously



FROM "TELEGRAPH AND TELEPHONE AGE" OF FEBRUARY 16, 1899. OUR FIRST DESCRIPTION OF WIRELESS TELEGRAPHY.

taxed the existing facilities of both the Postal and Western Union Companies.

The Western Union Company met the situation by developing to a high degree of efficiency a multiplex printing telegraph system based on the patents of Mr. Donald Murray, of London, England, while the Postal Company terminated all contracts for leased wires to brokerage concerns; thus releasing all of their wires for message traffic taken in over the counter.

In the year 1871, the number of telegrams handled daily in the main office of the Western Union Company at New York was 3,500. In 1875, this had grown to 35,000 telegrams per day. In the year 1917, approximately 200,000 telegrams daily were handled through this office, and it requires the space of three entire floors of the big telegraph building at 24 Walker street to house the apparatus and staff necessary to handle this great volume of traffic. Seating space is provided for 1,025 telegraphers.

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All of the regular "message" wires extending between New York and Chicago are operated by the printer system, as, also, are most of the principal direct circuits connecting New York with other large cities north, east, south and west.

The Postal Telegraph-Cable Company, also is doing an enormous business throughout the United States. Direct wires are maintained between New York and all cities of importance in this country and in Canada. The company's own cable system supplies rapid fire connections with Europe, via the Atlantic; and with China and Japan via the Pacific ocean.

At the present time,—twenty-five years after toll telephone service was inaugurated between New York City and Chicago—we find that there are about fifty thousand commercial telegraph employees in the United States. This is exclusive of railroad telegraph employees to an almost equal number.

There are approximately 250,000 miles of telegraph pole line, and 2,000,000 miles of telegraph wire; besides 320,000 miles of wire owned and operated by railroad companies, in the United States.

As an illuminating commentary upon the importance to the nation of the telegraph and the telegrapher, it may be pointed out that when the registration of the national resources was called for by the President, of the thousands of professions which men practice one of the very few considered in the registration was: "Are you a telegraph operator?"

Verily, as one writer has said: "The wire is serving. Seventy years ago a portrait painter sat at a clumsy desk in Washington and jiggled a metal tab with nervous finger. In Baltimore an armature clacked, and one understanding its untried speech translated the click into 'What hath God wrought?' That day was born the wire. Born a creature of service. Born to obliterate space and make the earth a back-yard for over-fence chattings between the peoples."

WESTERN UNION TELEGRAPH COMPANY

ANNUAL REPORT FOR YEAR 1919

THE annual report of the Western Union Telegraph Company, for the year ending December 31, 1919, submitted by President Newcomb Carlton, states that, "The work of reconstructing and strengthening the land lines and re-equipping the offices, commenced in 1910, has been continued. A considerable mileage of heavy iron wire, of such strength as to withstand serious sleet and wind storms, was erected as a further safeguard to the service. To improve the operation of the circuits, especially the automatic, twenty-three new repeater stations were established equipped with the new universal type high-speed repeaters. The automatic printing telegraph apparatus (multiplex) was installed on 107 additional circuits, making 368 circuits so operated, which carry 57 per cent. of the total message traffic."

The report also states that the engineering department of the company has succeeded in developing a printing telegraph system for use on ocean cables. The system was placed in commercial service on the submarine cable between Hearts Content, N. F., and Valentia, Ireland.

On December 31, 1919, there were in operation 215,651 miles of pole line, 789,937 miles of iron wire, 609,694 miles of copper wire, 2,973 miles of land line cables, 23,260 nautical miles of ocean cables, and 25,159 public telegraph offices.

The income account shows net profit after all charges and taxes available for distribution on the stock of $10,635,386, equivalent to $10.65 a share on $99,786,726 of its outstanding capital stock. In 1918 the company reported net profits after charges and taxes of $11,619,813, or $11.64 a share, on its capital stock. The company's net earnings before charges were about equally divided between receipts from corporate operation during the last five months of the year and the amount received from the United States Government for compensation for the period that telegraph and telephone lines were under Federal control.

The gross operating revenues from the land line system for the last five months of the year and from the cable system and maritime provinces for the year amounted to $55,308,639. Operating expenses for the same period, including reserves for depreciation, leases, taxes, &c., totalled $48,460,865. From the United States Government for compensation from January 1 to July 31 the company received $5,184,297, and an additional $1,606,523 was received from loans and investments, making total income before charges $13,638,595, against $12,396.726 in 1918. Interest on the company's bonds from August 1 to December 31 amounted to $554,937 and amounts transferred to reserves included $1,825,000 for accrued depreciation of cables and $623,271 for depreciation of securities, leaving net profits of $10,635,387, against $11,619,813 in 1918. Dividends of $6,982,472 were declared during the year and adjustments of surplus amounted to $1,356,000, of which $985,387 represented retroactive compensation to employees for 1918 and $471,051 for other adjustments. The total profit and loss surplus at the close of the year stood at $34,715,470, against $32,518,993 in 1918.

Newcomb Carlton, president of the company, told the stockholders in his annual report that the company has proposed to adjust its claims against

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the Government by accepting $921,511 as of August 1, 1919, with interest until paid. "The policy of the Post Office Department during the year," he added, "was constructive and eminently fair to the property." The value of plant extensions, equipment and betterments, added to property account during the year, less the value of property displaced, amounted to $8,848,965. Installation and reconstruction improving the service to a large extent, the report shows, went on through the year. The new Chicago building was completed at a cost of $2,011,600, and the new cable building on Broad Street, New York, is near completion. This building will cost when completed, the report estimates, approximately $525,000.

"Gross operating land line and cable revenues for 1919," the report says, corporation and Federal, with duplications excluded, amounted to $102,577,814, an increase over the corresponding revenues for 1918 of 18.3 per cent. In the latter part of 1918 and the early part of 1919 all operating costs had increased so materially that it was patent that telegraph rates would have to be increased if good service was to be maintained. After long and careful consideration of conditions, the Postmaster General ordered an increase of 20 per cent., effective April 1, 1919, in the rates for domestic telegrams, money transfer messages, leased wires and Government messages between points in the United States. The rates charged for ocean cable and press messages, money transfer premiums and charges for other services were not increased. Notwithstanding the increase in rates and volume of business handled, operating costs have so advanced as to leave only a moderate return upon invested capital.

"Increases in wages and other compensation authorized in 1919, including the wage increase effective January 1, 1920, amount to $13,540,000 on an annual basis, an increase of 24.7 per cent. over the annual payroll for 1918. For each dollar of operating revenue received in 1919 60 per cent. was expended for salaries and wages and benefits to employees. In conformity with its promise to the employees the company made the wage adjustment of January 1, 1919, retroactive to August 1, 1918, and these payments, amounting to $985,388, were charged to surplus. Disbursements for pensions, accidents, sickness and death benefits and wages during military service aggregated $1,015,361, an increase over 1918 of $75,736. The cost of vacations with pay was $1,290,000."

Some Wind.

A telephone "trouble shooter" was called out to establish communication between a nearby country estate and the city. Upon arrival at the estate the "trouble shooter" soon discovered that a fuse in the lightning arrester had blown out, and he reported to the subscriber, "Just a fuse blew out." "That so?" said the subscriber. "Well, by George, the wind does blow devilish hard out here at times, but I didn't think it could do that."—*Ladies' Home Journal.*

TELEGRAPH COMPANIES' LIABILITY LIMITED.

TELEGRAPH companies are justified in limiting their liability for unrepeated interstate messages as provided in the conditions on the reverse sides of telegraph blanks, declares the United States Supreme Court in a recent decision. The court holds that interstate messages are subject to the Interstate Commerce Act, which law permits reasonable rates for different kinds of telegrams such as unrepeated, repeated day or night messages, etc., and it is erroneous to conclude that under state laws the limitation of liability contracts in connection with such messages are void and not susceptible of being enforced because the contracts exempt telegraph companies from the consequences of their own negligence.

The opinion of the court was written by Chief Justice White, December 8, 1919. The case is known as Postal Telegraph-Cable Company, v. Warren-Godwin Lumber Company No. 91, October term, 1919.

The Chief Justice says in part in the opinion:

"In the first place, as it is apparent on the face of the Act of 1910, that it was intended to control telegraph companies by the Act to Regulate Commerce, we think it clear that the Act of 1910 was designed to and did subject such companies as to their interstate business to the rule of equality and uniformity of rates which it was manifestly the dominant purpose of the Act to Regulate Commerce to establish, a purpose which would be wholly destroyed if, as held by the court below, the validity of contracts made by telegraph companies as to their interstate commerce business continued to be subjected to the control of divergent and it may be conflicting local laws.

"In the second place, as in terms the act empowered telegraph companies to establish reasonable rates, subject to the control which the Act to Regulate Commerce exerted, it follows that the power thus given, limited of course by such control, carried with it the primary authority to provide a rate for unrepeated telegrams and the right to fix a reasonable limitation of responsibility where such rate was charged, since as pointed out in the Primrose case, the right to contract on such subject was embraced within the grant of the primary rate-making power.

"In the third place, as the act expressly provided that the telegraph, telephone or cable messages to which it related may be 'classified into day, night, repeated, unrepeated, letter commercial, press, government and such other classes as are just and reasonable and different rates may be charged for the different classes of messages,' it would seem unmistakably to draw under the Federal control the very power which the construction given below to the act necessarily excluded from such control. Indeed, the conclusive force of this view is made additionally cogent when it is considered that as pointed out by the Interstate Commerce Commission, (Clay County Produce Company v. Western

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Union Telegraph Company, 44 Int. Com. Rep. 670), from the very inception of the telegraph business, or at least for a period of forty years before 1910, the unrepeated message was one sent under a limited rate and subject to a limited responsibility of the character of the one here in contest.

"But we need pursue the subject no further, since, if not technically authoritatively controlled, it is in reason persuasively settled by the decision of the Interstate Commerce Commission in dealing in the case above cited with the very question here under consideration as the result of the power conferred by the Act of Congress of 1910; by the careful opinion of the Circuit Court of Appeals of the Eighth Circuit, dealing with the same subject (Gardiner v. Western Union Telegraph Company, 231 Fed. 405); and by the numerous and conclusive opinions of state courts of last resort, which in considering the Act of 1910 from various points of view reached the conclusion that that act was an exertion by Congress of its authority to bring under Federal control the interstate business of telegraph companies and therefore was an occupation of the field by Congress which excluded state action."—*Boston Current Affairs.*

A "Dot and Dash" Duck.

A correspondent of the London, Eng., *Morning Post* writes to that paper as follows: "A neighbor of mine who bought some ducks a few weeks ago found that one of them was exceptionally intelligent, and had an unusually loud and penetrating voice. He had a friend living about 200 yards away, to whom he had often wanted to send short messages. My neighbor, who during the war was a wireless operator on one of his Majesty's ships, soon discovered that if he took the duck up in his arms, it rapidly responded with a long-drawn qu-a-a-a-a-ck when he gently pulled its tail and held it for a second or so, and that it also readily shot out a short sharp quack when he pulled the tail and let go instantly. He now sends his messages by Morse code to his friend, who is looking for an equally intelligent duck with a voice of 200 yards' range with which to reply."

Old-time railroad telegraphers may remember the story about Tanquary's dog. According to the story, when Mr. Tanquary played a friendly game of poker, the dog could be depended upon to take up a position in the rear of his master's partner where he might observe the current value of said partner's "hand." About the time the betting started, Tanquary's ear translated dot and dash signals made by a stub-tail on the floor. It was such a cinch that Mr. Tanquary had to disregard the signals occasionally in order to be allowed to stay in the game.

THE PARIS, FRANCE, central telegraph office handles about 125,000 telegrams per day. During the war the number of messages mounted as high as 336,000 per day.

TELEGRAPH LINE DIFFICULTIES IN ALASKA—LINES BROKEN BY HEAVY DEPOSITS OF FROST.

E. R. McFarland, superintendent of Government telegraph and telephone lines in Alaska, states that an unusual source of interruption to telegraph and telephone service occurred on the lines of the Government railroad in Alaska during the past winter. After a protracted period of calm, clear and very cold weather in the vicinity of Cook Inlet and around Turnagain and Knik Arms, the wires became so heavily loaded with accumulations of hoar frost that wires began to give way. The accumulation reached a diameter of as much as five inches on number nine B&S copper wires, and from eight to ten inches on cables and messengers in the Anchorage townsite.

This phenomena is not unusual in parts of the north, but it it is thought to be the first time that wires in normal condition have given way to the strain. In this instance many trees were broken off with the great weight of the frost. Its texture appeared to be similar to that found on nail heads during severe cold snaps. The accumulation is most in evidence in the vicinity of open water. It was found that clearing the wires of frost was easily accomplished, where the lines were accessible, by jarring or shaking the poles and fixtures. In rough territory and where there were several feet of snow, much of the line was cleared by linemen throwing light hand-lines across the leads and drawing them off again. In some cases light, smooth weights were fastened to the hand-lines.

Alaska Calls Telegraphers.

What the Great Northern, Northern Pacific, and Union Pacific Railroads offered to operators in the way of romance and adventure thirty years ago, Alaska holds out to-day. The telegraph service in Alaska, is the last frontier for the pioneer who desires experience in the open, where mountains are big and men are big. Many of the men who are to-day high up in the telegraph service in this country, pioneered in the West when they were young telegraphers. The independence, self-reliance, and resourcefulness developed under the conditions prevailing where street cars and restaurants are scarce, is the sort of mental equipment which gets a man somewhere later in life. Colonel B. O. Lenoir, with offices in the Arcade Building, Seattle, Wash., is in charge of the Washington-Alaska military cable and telegraph system, and judging from the news items in a recent number of the service magazine, *Northern Lights,* published by the men in the Alaska service, is popular as a superior officer.

DURING THE WAR sixty per cent. of the telegraph facilities between offices in Great Britain and offices in France was used for military purposes.

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Radio Telegraphy

Radio Corporation of America.

C. J. Ross, comptroller of the company, who has been on the Pacific coast for several weeks past, has returned to his office.

Col. Curtis H. Nance, of the commercial department, sailed on the *Philadelphia* recently for Caracas, South America, on business of the company.

A. E. Reoch, plant engineer, and W. A. Graham, his assistant, have returned from an inspection of the Marion, Mass., station.

Schuyler R. Ford formerly chief gunner, United States Navy, and an executive officer in the Sayville, N. Y., radio station has been appointed engineer in charge of the high-power station at New Brunswick, N. J.

F. C. Larkin, formerly gunner in Navy service, has been appointed shift engineer at the New Brunswick, N. J., station.

G. A. Burns has been appointed a receiving expert at the Belmar, N. J., station.

H. Edwards, until a year ago in the government telegraph service in Jamaica, and who later completed the Marconi course of instruction in New York, returned recently from a trip to Denmark. Mr. Edwards is an expert operator and is studying radio engineering.

Saim Selim, American radio operator, had the good fortune while on a European trip recently to have the ship on which he is serving ordered to Constantinople for cargo. He was thus enabled to spend a day or two with his relatives in that city.

President J. V. L. Hogan, of the Institute of Radio Engineers, on the evening of April 7 entertained a party of radio engineers at the City Club, New York. Mr. Hogan is receiving the congratulations of his friends upon the arrival on March 27 of John Vincent Hogan, jr.

The Independent Wireless Telegraph Company will have its Babylon, L. I., station in operation by May 1, operating on a twenty-four hour per day service. At the start the station will have spark transmission, but the intention is to have an arc installation ready for service in July.

A Danish official commission, appointed to consider the erection of a long distance radio telegraph station in Denmark, has sailed for the United States, expecting to arrive here about April 17, to negotiate regarding the possibility of linking up the Danish with the American radio stations.

In Chile, during the year 1919, the 372 telegraph offices received messages aggregating 3,843,804 words. During the year the five state-owned radio telegraph stations received 393,453 words and dispatched 328,599 words.

In Peru, during the year 1919, radio telegraph stations were opened at Eten and Trujillo. At the present time stations are being constructed at Salaverry, Paita, Cajamarca, and Callao. In addition to these stations Peru has radio facilities at Puerto Bermudez, Masisea, Orellana, Leticia, Itaya, Iquitos, Putumato, Ilo, Cachendo, Chala, Pisco, El Fronton, San Christobal, Huaman, and Lima.

In Colombia, South America, work has commenced on the radio telegraph stations at Baranquilla and Puerto Columbia. British Marconi engineers are already on the ground to begin the construction of the radio stations at Bogota, Medellin, Cali, and Cucuta.

Institute of Radio Engineers' March Meeting.

At the regular meeting of the Institute of Radio Engineers, held in the Engineering Societies Building, New York, on March 7, a paper was presented on the subject "The Reduction of Atmospheric Disturbances in Radio Reception," by Dr. Louis W. Austin, head of the United States Radio Laboratory, Washington, D. C. Dr. Austin described and compared the various systems in use at the stations at Bar Harbor, Me., Belmar, Lakewood and Anacostia.

About 200 radio engineers attended the meeting. Those present included: G. W. Pickard, C. A. Hoxie, E. H. Armstrong, E. F. W. Alexanderson, Lloyd Espenschied, David Sarnoff, Edgar Russel, Guy Hill, F. K. Vreeland, W. A. Winterbottom, J. V. L. Hogan, Dr. A. N. Goldsmith, E. D. Forbes, Lester Israel, and J. A. Proctor.

Radio Communication Company.

Beginning at 8 p. m., March 26, the Radio Communication Company announced the broadcasting of news items supplied by the International News Service, and the Universal Service. Transmission is on a wave length of 2,100 meters. The company has stations in the vicinity of New York with calls

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WHB and WSK. Cyril D. Reinhard is general superintendent of the company with offices at 217 Broadway, New York.

"WCG" Radio Station.

The reopening of the International Radio Telegraph Company's station (WCG) in New York, for communication with ships at sea has brought into the etheric circuits a class of telegraph signaling which is a joy to old-time, experienced operators. Not only is the signal tone pure and beautiful, but the operators are excellent senders, and know how to get rid of business on hand without messing it up. While the Navy Department had charge of the commercial stations during the war the Navy staff accomplished wonders in many ways, but the message work of the Navy telegraphers always seemed to be of an amateurish sort. At least this was true, later, when the ban was lifted on amateur radio receiving stations.

Federal Telegraph Company Retains Wire Line.

The Federal Telegraph Company, organized on the Pacific coast to conduct a radio telegraph business, during the war period was prohibited from using its radio stations for commercial business In order to hold the business it had built up, the company leased wires between San Francisco, Seattle and Portland, from the Pacific Telephone and Telegraph Company, over which traffic has since been handled.

By agreement on March 12, between the telephone company and the Federal Company a temporary restraining order was issued by Superior Judge Murasky of San Francisco whereby the wire lines leased by the latter company will remain at its disposal until January, 1921. The Federal sued for an injunction on the ground that it had not been given sufficient warning of the proposed change and would suffer great loss because it could not duplicate the service and did not have time to build new equipment of its own to take the place of that it was leasing.

International Radio Telegraph Company

Instructions have been sent out for coastwise and transatlantic vessels carrying radio apparatus to transact business with the offices of this company's Bush Terminal office, Brooklyn, N. Y., (WCG), and with the company's offices at Newport, R. I., and New London, Conn.

I. R. E. Standardization Committee.

President Hogan of the Institute of Radio Engineers has appointed the members of the Standardization Committee of the Institute for the coming year. The committee is to take up the work of framing definitions for the large number of new technical terms which are gaining currency in radio engineering literature and in radio laboratories. The personnel of the committee consists of Donald McNicol, chairman, and E. F. W. Alexanderson, E. H. Armstrong, Dr. L. W. Austin, O. B. Blackwell, Dr. J. H. Dellinger, Dr. W. S. Eccles, E. D. Forbes, Dr. A. N. Goldsmith, Captain Guy Hill, Dr. A. E. Kennelly, F. A. Kolster, V. Poulsen, Dr. John Stone Stone, C. H. Taylor, L. S. Whittemore.

The Deepest Point in the Ocean.

The deepest known point in the ocean is near the Island of Guam, in the Pacific. Here the United Sates Ship *Nero* found bottom at 5,269 fathoms (six miles), or 2,612 feet more than the height of Mount Everest, the world's highest peak. Life has been found to exist at a depth of 4,173 fathoms.

Height and Length of Waves of the Sea.

The height of the waves in a storm rarely exceeds 12 feet; in very bad disturbances on the high sea they may reach a height of 50 feet. Their length is never over 600 feet. In the southern parts of the Pacific waves 43 feet in height have been measured. In the southern part of the Atlantic 39 feet, and in the Bay of Biscay and in the Mediterranean 12 feet. At places where the waves strike at an object, such as a lighthouse, they rise, of course, much higher—at Bell Rock, for instance, over 100 feet and at Unst over 200. On the open sea, however, they never rise over 50 feet.

New Radio Call Book.

The Consolidated Radio Call Book, which contains 2,500 calls in addition to those listed in the Berne Bureau's call book of April, 1918, is now ready for distribution. The book will be of great value both to the amateur as well as the professional radio operator. In addition to the complete list of radio ship and shore station calls of all nations the book contains a large amount of information relative to radio traffic handling, rates, etc. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, at $1.00 per copy.

"THE SUCCESSFUL EXECUTIVE must seek and duly consider the opinions of his subordinates, and of men who are experts in the subjects under discussion. Then and then only should he begin forming his own conclusions. This is the judicial method; the truly democratic one."—*Leonard Wood.*

THE OLD WIRE CHIEF SAYS: "It's a good idea to keep in mind that you are going over the trail only once. You can't come back later on to patch up work improperly done or rectify wrongs of any kind."

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Radio Corporation's Office at No. 64 Broad St., New York.

The staff at the New York office of the Radio Corporation of America has been carefully chosen and is an excellent representation of the aristocracy of the telegraph profession. It may, therefore, be safely predicted that a record for accuracy and efficient service will soon be established.

Superintendent H. Chadwick is well known in both the cable and wireless fields, and brings with him a wealth of experience gained through nineteen years of service in the operation of cable and land-line telegraph apparatus both in America, and the United Kingdom. For eleven years he was in the employ of the Commercial Cable Company, serving in various capacities in the Liverpool, Waterville and New York offices. Previously he was for two years in the British Post Office service. Since joining this company in 1914, he has served in several departments, but is perhaps best known for his reputation as an operator of ability. He also made many friends while instructor at the Marconi Institute. The installation of apparatus in the New York office was carried through successfully under his immediate personal supervision.

The supervisors are C. J. Weaver, of Sea Gate fame; W. A. Corkish, late of Panama, and T. Anderson, of the Commercial Cable Company. Mr. Charles Weaver was connected with the cable service for many years and later in the wireless service he established an enviable reputation at sea and at the old Seagate Station. Mr. Corkish comes from the All American Cables. Mr. Anderson has to his credit, years of experience with the Commercial Cable Company, where he was highly regarded for his ability.

Others of the operating staff are:

R. P. Woodford, J. L. Lynch, R. N. Kay, R. Blanqui, E. J. Sheehy, F. D. Heiser, F. Nolan, D. J. Murphy.

The clerical staff is as follows:

W. H. Wallace, counter clerk; W. R. Holligan, counter clerk; D. Platt, delivery clerk; O. Sodeman, delivery clerk; A. J. Burns, delivery clerk; A. E. Francis, telephone clerk; B. L. Frankhouser, telephone clerk; O. P. Deighen, service clerk; J. McQuade, service clerk; W. H. Sherman and V. F. Squazzo, check clerks; E. J. Marshall and E. Metz, examiners.

The Commercial Department is represented at this office by John Shea and his assistant.

OPERATING DEPARTMENT IN THE NO. 64 BROAD STREET, NEW YORK OFFICE OF THE RADIO CORPORATION OF AMERICA. THE SEVEN OPERATORS IN THE PICTURE ARE WORKING CIRCUITS BETWEEN THIS OFFICE AND THE LONG DISTANCE RADIO STATIONS ON THE COAST.

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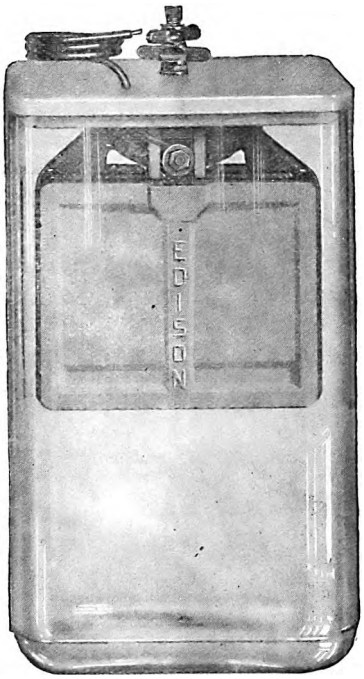
FOR CLEAR TRANSMISSION



EDISON PRIMARY BATTERY DIVISION

THOS. A. EDISON, INC.

BLOOMFIELD, N. J.

HALL SWITCH & SIGNAL CO.

GARWOOD, N. J. **CHICAGO**

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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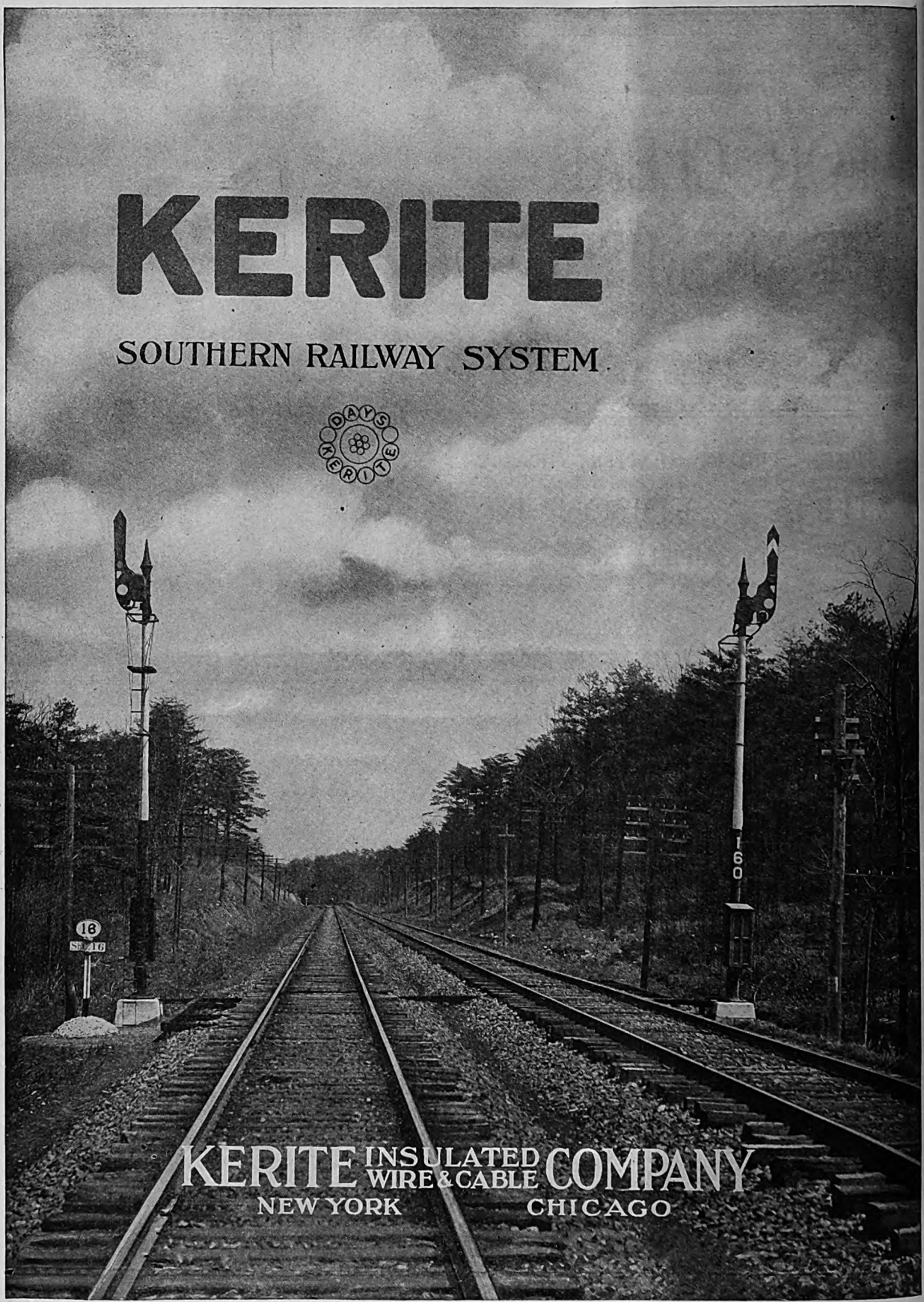

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THE RAILROAD
TELEGRAPH AND TELEPHONE

Southern Pacific Railroad

L. O. JONES, telegraph and telephone engineer, has just completed the installation of a Morkrum green code printer in the Los Angeles office.

E. L. KING, superintendent of telegraph, San Francisco, was in Chicago on March 19, attending committee meetings of the Telegraph and Telephone Division, American Railroad Association.

H. H. COOPER, manager of the Los Angeles telegraph department has been in a hospital for some time due to illness. While away he was relieved by J. A. Hage.

THE MORKRUM PRINTERS in the Los Angeles, Cal., office are in charge of R. E. Steere.

C. T. DAY, telegraph supervisor, is planning an enlargement of the facilities and staff of the Los Angeles office to take care of an increasing volume of business.

Railroad Telegraphers' Salaries.

According to a statement recently issued by the Bureau of Railway Economics at Washington, D. C., the salaries of telegraph employees in railroad service in the year 1919 increased over the year 1915, as follows: Telegraphers, telephoners and block operators, 68.8 per cent.; telegraphers and telephoners operating interlockers, 68.9 per cent.; levermen (non-telegraphers), 70.7; telegrapher-clerks, 76.5 per cent.; agent-telegraphers, 90.2 per cent.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa

THE OLD WIRE CHIEF SAYS: "The best small-town operator I ever knew was a fellow named Billy Brown. He was so good that the first thing we knew he was made manager at a big town."

M. A. BUEHLER, formerly sales manager for the Western Electric Company, at Omaha, Neb., has been made sales manager at the Minneapolis office. Mr. Buehler joined the company's organization in 1915 and became sales manager at Omaha during the fall of 1917.

ELIOT LUM has been promoted to the position of sales manager for the Western Electric Company at the Omaha office, to succeed Mr. Buehler. Mr. Lum entered the employ of the company as a student in the educational courses in 1905, directly after his graduation from college. In 1907 he became a member of the telephone engineering department of the Minneapolis house, joining the Omaha organization in the same capacity in the winter of 1912.

"THE TELEPHONE IN THE MOTION PICTURE THEATRE" is the name of a booklet recently issued by the Stromberg Carlson Telephone Manufacturing Company, Rochester, N. Y. The booklet describes itercommunicating telephone systems which are of simple design, easy to operate, and reliable.

Page Steel and Wire Acquired by American Chain Company.

The American Chain Company, Inc., of Bridgeport, Conn., has purchased the control of the Page Steel and Wire Company, with mills at Monessen, Pa., and Adrian, Mich. It is the intention of the American Chain Company to continue the business of the Page Steel and Wire Company as heretofore, taking only its surplus product. The Page Steel and Wire Company's plants consist of open hearth furnaces, rolling mill, wire mills, as well as fence factories.

The new officers elected under the reorganization of the company are: Walter B. Lashar, president; William T. Morris, vice-president; Wilmot F. Wheeler, treasurer; John E. Carr, assistant treasurer, and William M. Wheeler, secretary.

E. C. Sattley, general manager of the Page Steel and Wire Company will continue in that capacity with offices in Pittsburg, Pa.

The American Chain Company has its general sales offices in the Grand Central Terminal Building, New York City, and district sales offices in Chicago, Boston, Philadelphia, San Francisco, Portland and Pittsburg.

THE OLD WIRE CHIEF SAYS: "During the years I have been at the board I have seen bright sunshine clear up many a case of trouble."

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Students' Course in Technical Telegraphy

ARTICLE 3.

When we started this series of lessons in technical telegraphy we had no idea we were to have so large a number of new readers. It is very gratifying to have so many of the younger men take up the study seriously. We are gratified, also, to know that the ideas we have formed as to just what sort of a course of instruction would meet the needs of present day ambitious students, are shared generally. It has been noted by many followers of this course that we did not start in with long, drawn-out descriptions of chemical batteries, or with several chapters on mathematics, and it may be here stated that the necessary arithmetic and calculations will be introduced, not as a separate study, but when we arrive at those portions of the instruction where it is clear to the student that figures are of value.

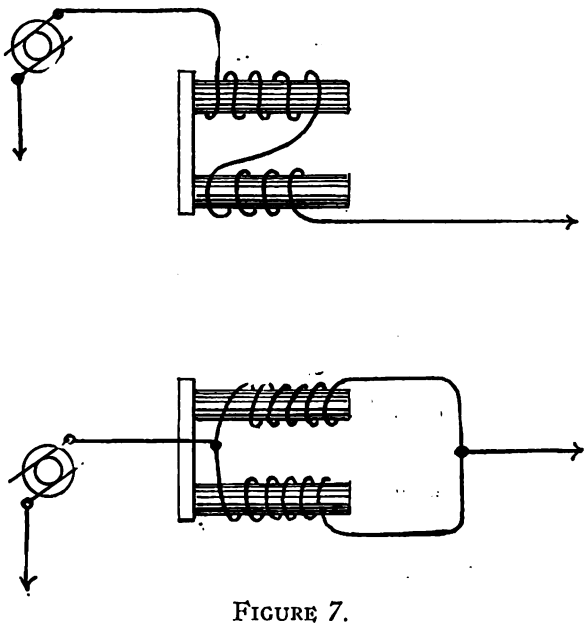

FIGURE 7.

Now, to resume where we left off in the April 1 lesson.

In Fig. 7, at the top is shown the method of winding wire upon the iron cores of a relay, sounder, electric bell, or any other electro-magnetic instrument, when the windings are in *series*. At the bottom is shown how the cores are wound with wire when the windings are connected in *multiple*. It may be noted that in each case one wire enters the relay from the source of electric current and one wire leaves the instrument for connection elsewhere.

The direction of winding upon each core is such that when the two cores of an instrument are joined by an iron heel-piece, as shown in both illustrations, there will be a north and a south magnetic pole presented to the moving armature of the instrument.

Most instruments used in telegraph and telephone work have their electro-magnets wound in series. In practice about the only instance where main line telegraph relays are wound in multiple is on some long railroad circuits where a large number of relays are connected in the line. Connecting the relays in multiple materially reduces the instrument resistance of the circuit.

Fig. 8 illustrates how sounders in telegraph offices are connected in multiple. At the top is shown the simple theory of the arrangement. The source of current, a motor-generator, is shown at the left, and between the two wires leading from the brushes of the generator seven telegraph sounders are connected. It is evident that if an open circuit occurs in the wiring of any one of the sounders this defect will not interfere with the operation of any one of the remaining six sounders. In the upper sketch (Fig. 8), so that the multiple idea may be clearly presented, the telegraph relay connections have been omitted.

In the bottom diagram (Fig. 8) the actual wiring of the *local* contacts of the relays, and the connections to the sounders are shown. It may be observed that the brushes of the generator are connected to bus-bars, or leads, of comparatively heavy wire or metal strip. Each relay is marked "R" and each sounder "S". On each relay two binding posts are shown without wire connections. It is into these posts that the main line wires are connected—one post being connected to the sending key and the main line battery while the other post carries the wire leading to the distant office.

The value of the multiple connection in this case is that one generator may be used to supply current for the operation of a large number of sounders. If the *series* arrangement were used each sounder would require a separate generator or battery.

LOOP CIRCUITS.

Suppose that two stations "Sy" and "Ha" (Fig. 9) are connected by two line wires, No.'s 27 and 30, and that at point D between the two stations an

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accidental contact occurs between wire No. 30 and the earth. While this condition remains wire No. 30 cannot be used in service. It becomes necessary, therefore, for whichever station has testing instruments to locate the point at which the wire is grounded. Assuming that station "Sy" has the necessary testing apparatus (for instance a Wheatstone bridge) he asks station "Ha" to *loop* wires 27 and 30 so that he may measure the electrical resistance of the two wires *looped,* making up a continuous circuit A, E, B. Although in a later lesson we shall go into the details of testing it may be said here that after the resistance of the looped

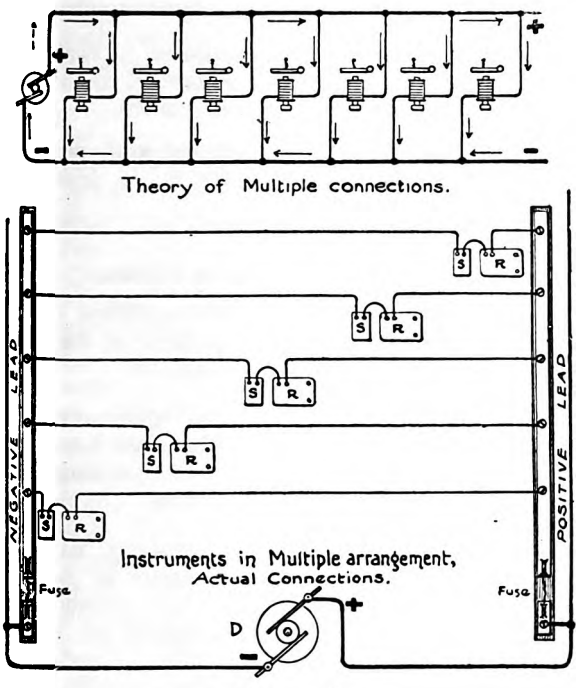

FIGURE 8.

wires has been ascertained the testing office can quickly determine the resistance of the wire between B and D, and by dividing the resistance per mile of the wire into the total resistance B to D, can instruct the lineman how many miles from "Ha" or "Sy" the fault may be found.

Another case of the necessity for a loop circuit is as follows: A main line wire extends between stations "X", "Y" and "Z", fifty miles apart. The line wire may be batteried at one end or at both ends. Now, if it becomes necessary to connect into this circuit a branch office, say a mile or two from the office at "Y", it is customary to connect the branch office into the main line wire by means of a loop. It would not do simply to extend a single wire from the main office to the branch office as that sort of connection would *ground* the main line wire and prevent "X" from communicating with

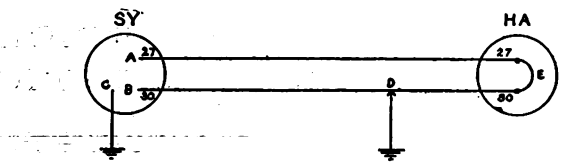

FIGURE 9.

"Z". A single wire connection to the branch office would duplicate the conditions shown in Fig. 8, where metallic contact between D and the earth intereferes with through operation of the circuit.

(*To be continued.*)

Cause of Tides.

The theory of earth tides is not a new one, as the varying effect of the sun and the moon on the earth is tremendous. Observations have been taken eighty-two feet below the surface with a horizontal pendulum so delicately constructed that measurements with it could be taken of variations one-hundred-thousandth part of a second. The earth appears to be affected by the sun and moon twice in each twenty-four hours, the moon exerting twice the influence of the sun. The whole shape of the earth is affected, and not merely the crust. It is an actual deformation of the ball, setting up bodily tides, which follow the direction of the ordinary ocean tides in half-day periods. Scientists, who have made this subject a life-long study, have come to the conclusion that the earth has a degree of rigidity equivalent to that of a ball of steel of the same size, but the evidence is against the idea that there is a viscous stratum between the crust and the solid central core. There is now no doubt the earth flows and ebbs much like the sea.

Coldest Place on Earth.

The lowest temperature ever recorded was at Werchojansk, in the interior of Siberia, January 15, 1885. It was ninety degrees and a fraction below zero. In that section, the earth freezes to a depth of a hundred feet and in the warmest season it never thaws.

S. O. S!

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY

W. J. BLENHEIM has been appointed general traffic manager of the Western Union Cable System, with headquarters in New York. Mr. Blenheim will be in charge of all traffic matters incidental to the operation of the cable system.

R. E. CHETWOOD, engineer of plant, New York, is absent on an extensive trip over the system.

T. W. CARROLL, general manager, Eastern Division, visited offices in Pennsylvania during the first week in April.

JOHN SIMMONDS, of General Manager Carroll's office, is in Pittsburg in connection with the service.

THE RENT SITUATION in New York City has driven a number of the executive office people to seek homes in New Jersey where they will join the ever increasing ranks of the commuter. Eastern Division officials who have found homes across the Hudson include C. B. Horton, T. B. Clark and T. J. Farrell.

RECENT EXECUTIVE OFFICE VISITORS included J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad; J. S. Calvert, commercial superintendent, Philadelphia; E. Coykendall, president of the Ulster and Delaware Railroad, and C. C. Mothersead, manager of credits and collections at Washington, D. C.

A. J. HELDMAN has been appointed chief operator of the cable office, New York.

C. E. HARRISON of Jacksonville, Fla., has been transferred to Atlanta, Ga., where he will be chief operator, relieveing J. T. Goodrum, furloughed.

J. W. BIBB has been appointed chief operator at Brownsville, Tex., vice Roy Dobbins, resigned.

WILLIAM BUTLER has been appointed chief operator at Tucson, Ariz.

SIMON S. LAWHEAD has been appointed chief operator at Flagstaff, Ariz.

A CONFERENCE AND BANQUET of Western Union managers was held at the Commercial Club, Nashville, Tenn., on March 27. In addition to managers from offices in Tennessee, Kentucky and Mississippi, there were present H. C. Worthen, general manager, Atlanta, Ga., A. C. Kaufman, New York, and J. Cheatham, superintendent.

CHARLES J. DIEHL, chief operator of the Waterbury, Conn., office, has been advanced to chief operator of the New Haven, Conn., office.

O. T. MOORE has been appointed manager of the office at Greensboro, N. C., vice A. R. Horry.

New York Western Union.

THE MESSENGERS of the Metropolitan Division gave a very successful minstrel show at the Washington Irving high school on April 14.

H. E. ROBERTS, supervisor of time service and of the transfer service department, has been ill for several weeks, and at present is recuperating in the Berkshire hills near Pittsfield, Mass.

THE EMPLOYEES of the fourth district, Metropolitan Division, held their annual dinner at the Hotel Bossert on April 15. The affair was conducted under the auspices of the Association of Western Union Employees, Local No. 131. Dancing followed the dinner. The committee in charge consisted of Miss L. O'Grady, W. H. Sembler, Miss K. Jackson, Miss E. Washburn, Miss. A. B. Lyons, B. Weisbein, L. R. Pitkin, and H. E. Hayden.

THE MANAGERS AND COMMERCIAL AGENTS of the fourth district, Metropolitan Division, have formed an organization to be known as the Plus and Minus Club. W. J. Browner is president; H. E. Hayden, Allan Schwartzberg, and L. R. Pitkin, vice-presidents.

HOWARD I. KRUM, AND R. L. BAILEY of the Morkrum Company, Chicago, were New York business visitors on April 8. The Morkrum Company has installed printing telegraph instruments on an Associated Press circuit between New York and Washington, with two branch office drops at Philadelphia, Pa., three at Baltimore, Md., and with transmission facilities at both New York and Washington.

Association Western Union Employees.

The Cable Abstract and Billing Bureau, Local No. 128, Association Western Union Employees,

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will hold an informal dance on Friday evening, April 23, at Sonia Hall, Bedford Avenue and Putnam St., Brooklyn.

The officers of this Local are: W. G. Roberts, president; H. A. Konninger, secretary and treasurer. The entertainment committee consists of E. W. Van Buskirk, chairman, and E. F. Jester, J. F. McMahon, J. J. Ahearn, M. C. Higgins, K. L. Famina, A. J. Kramer, A. E. Kertin, J. J. Murphy and M. Slomon.

The officers and entertainment committee of the Local have plans under way to make the dance a big success. Cash prizes will be awarded in various dancing contests. Kielgast's famous jazz band will furnish the music. The secretary's office is in room 700, No. 62 Broadway, New York.

Western Union Bowling Championship.

The inter-city bowling match between Western Union teams was held on March 29. The Omaha, Neb., team rolled the highest score, which carries with it the Western Union championship for the United States. Teams from the following cities competed: Omaha, Dallas, Chicago, Denver, San Francisco, New York and Atlanta.

The scores of the separate games, together with the totals and the ranking of the teams is as follows:

Rank	*1st*	*2nd*	*3rd*	*Total*
1. Omaha	881	971	897	2749
2. Dallas	774	914	832	2520
3. Chicago	794	832	868	2494
4. Denver	830	805	859	2494
5. San Fran.	770	814	889	2473
6. N. York	809	793	815	2417
7. Atlanta	676	740	758	2174

Inter-city matches have been rolled in previous years, but this is the first year a team from each division has tried for the championship. Plans are already under way to increase the number of teams qualified to compete in next year's tournament

The committee in charge of arrangements for the tournament consisted of J. C. Hubbard, C. C. Maxson and E. D. Pitt.

Pittsburg, Penn., Western Union.

E. W. SCHULTHEIS, of the Morse department, has been transferred to New York main office.

THOMAS H. CAULEY, lately with the Canadian Pacific Railway Telegraphs, in Canada, has joined the Morse staff in this office.

P. OBERFIELD has been transferred from the commercial department to the traffic department.

THE EMPLOYEES of the Pittsburg office publish a semi-monthly Bulletin entitled "Traffic Smoke." The sheet contains a considerable amount of local gossip.

A BRANCH OFFICE has been established in the Hotel Henry at Pittsburg, Pa., with Miss B. Richardson as manager.

Philadelphia Western Union.

THE TRAFFIC DEPARTMENT has started a series of monthly meetings with Chief Operator F. R. Webb as chairman. Under the management of Mr. Webb and General Traffic Chief Harry Emanuel the Philadelphia office is rendering high grade service.

I. D. MAIZE, well-known the country over, celebrated his seventy-eighth birthday on February 28. The Traffic Department staff presented Mr. Maize with a memento of the occasion. He has been in the service fifty-nine years.

EDITH UNWIN AND GERTRUDE WHITECAR, telephone recorders have been transferred to the Los Angeles, Calif., office.

EMMA S. NICHOLSON of this office was married on February 18, to Frank H. Miller. Mrs. Miller will continue her service in the cashier's department.

J. A. EVANS, supervisor in the multiplex department, Boston, Mass., main office, has the sympathy of his telegraph associates in the recent death of his father.

R. W. HALL has been appointed chief clerk to Superintendent Ames at Boston, Mass.

Western Union Lake Division.

OPERATORS in the Chicago main office who have made enviable records recently covering speedy transmission without error complaints, are: Betty G. Quay, Lucy Phelps, Olga Platsky and Velma Pogozelski.

H. R. PACE, manager at Bloomington, Ills., has been appointed commercial agent in Superintendent Brown's district, Chicago.

G. A. TRAPP has been appointed manager at Bloomington, vice H. R. Pace. Mr. Trapp has been manager at Rock Island, Ills.

J. C. CALKINS, heretofore acting as relief manager, has been appointed manager at Rock Island, Ills.

J. A. EK, of Superintendent A. R. McGrath's department, who has been in the service but a short time, is making excellent progress and has been advanced to a position in Superintendent Brown's office as commercial agent.

THE TORNADO which visited the central west on March 28 caused considerable damage to telegraph lines in the Lake Division. At Wilmettee, Ills., the building in which the Western Union office is located, during the storm lost a large section of its

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roof, but fortunately none of the employees was injured, and although many wires were torn from poles, service was restored within two hours after the storm had passed. Other buildings in Wilmettee, including the city hall, as well as many of the city's century-old elm trees, were prostrated.

E. V. PARSONS has been appointed manager of the office at Oberlin, Ohio, vice W. E. Stone, the latter being transferred to Tiffin, Ohio, as manager.

L. M. WITHERS, manager at Gallipolis, Ohio, has been absent from duty for some weeks due to an attack of influenza. He is now recovering.

W. H. BLECHINGER has been appointed manager at Marietta, Ohio, vice J. K. Morgan, resigned. Mr. Blechinger has been manager at Fostoria, Ohio.

E. R. KAPP, formerly with the Postal Telegraph-Cable Company, has been appointed manager at Fostoria, Ohio.

FOREST COYER has been appointed manager at North Baltimore, Ohio, vice Mrs. Ruth Henrich, resigned.

CHARLES A. SCHLEGEL has been appointed manager at Sturgis, Mich.

JOSEPH A. KOTHMAN has been appointed chief operator at Jackson, Mich.

HARRY RUST has been appointed manager at Linton, Ind.

MISS RUTH DOYLE has been appointed manager at Clinton, Ind.

MISS M. GREGORY has been appointed manager at Lebanon, Ind.

MISS CONSTANCE LAMPSON has been appointed manager at Culver, Ind.

JAMES P. BRADT, one of New York's leading telegraphers in the latter seventies and early eighties, for the past twenty-five years identified with the Columbia Graphophone Company, at New York, Berlin, Paris, London, and Toronto, after spending the winter in Southern California, has returned to New York where he will remain for some months. Mr. Bradt retired from active business last year.

Constant Variety Makes "Job" Fascinating

BY A. B. HUGHES

Wire chief New York Telephone Co. Pen Yan, N. Y.

I AM a wire chief in a small country town. About a mile south lies the beautiful Lake K———, which is a centre of activity in summer, but dreary and lonesome during the winter months. The roads are impassable; even our railroads have weekly rests.

We have approximately eleven hundred stations —about seven hundred working local battery, and the remainder magneto. We switch for seven switching service companies. The equipment in the central office is of the mongrel type, part Century, part Stromberg, and the remainder Western Electric. The outside plant is in first class condition, having been recently rebuilt.

Monday morning sees me refreshed, and ready for any emergency.

Arriving at the office at 7:30 a. m., I proceed to test our toll lines. Finding a toll line in trouble means a man, conveyance, and material to clear the same. These have to be ready so that the man can start on "His Job" at 8:00 a. m. If clearing that toll line comes within the scope of my day's work, I have first to definitely settle in my mind that nothing of importance will disrupt the service rendered by the company during my absence, due to any failure on my part.

The telephone bell rings. A voice *without* the smile inquires for the man that fixes the telephones. Upon telling him that I'm the man, he begins: "What the —— is the matter with my telephone? Why the —— don't this —— bell ring?"

A soft word turneth away wrath, but it takes several soft and diplomatic phrases to appease that of Mr. X.

While testing the reported trouble before I leave town to clear the toll line, I notice that quite a number of lines in the one hundred block are reported *"Cannot get Central."* This immediately brings before me a mental picture of the *"line circuit"* with its source of battery, and the fuse protection. I take one look at the fuse panel (which has no fuse alarm) and see that the fuse is blown. After a little physical and mental exertion I locate a *"ground"* on one of the line relays.

This trouble fixed, I am on the point of leaving, when the chief operator calls me back. *"The light stays in all the time on No. '5 panel.'"*

I retrace my steps with anything but pleasant thoughts of relays. It requires a good deal of persuasion to adjust some of these relays and you have to stand on your head to do the work.

Finally I manage to get the proper turn of the adjusting screw to make this relay docile, and I am at liberty to clear the trouble on the toll line. If it's summer, it's really grand to roll along enjoying the air and ever on the alert for the trouble. This is the most fascinating part of my work.

It is constant variety that makes this "Job" of mine so fascinating. I've tried other work, with seemingly much better prospects of advancement, but I always revert to the "maintenance" end of the telephone game and "My Job." What is there in this dealing with two extremes consecutively,—a grouchy bear of a subscriber one minute and the whimpering self-conscious one the next; a wave of trouble and the calm without any; the summer and its pleasures and the winter with its hardships.

My job is my very life.—*The Telephone Review.*

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POSTAL TELEGRAPH-CABLE COMPANY.

EDWARD REYNOLDS, vice-president and general manager, left New York on March 25 on a general inspection trip. Before returning to New York Mr. Reynolds expects to cover the principal offices in the Western and Pacific divisions, as well as visiting a number of offices in the Mackay Company territory.

W. C. DAVIET, assistant to the general manager, recently visited Cincinnati, Indianapolis, St. Louis, Louisville, and Memphis, in connection with the company's long distance telephone service.

J. F. SKIRROW, chief engineer, and F. J. Kernan, auditor, were recent Chicago visitors.

J. H. WOOTEN, of the Galveston, Tex., office of this company, delivered an address at the March 24 meeting in Galveston of the Rotary Club. Mr. Wooten's talk related to telegraph and cable service.

P. S. DURGIN, manager at Worcester, Mass., continues to build up his office receipts. Under his management the business at Worcester necessitates frequent additions to equipment and facilities.

H. T. FORD, heretofore cashier of the office at Indianapolis, Ind., has been advanced to the managership of the main office, vice G. L. Pierce, resigned.

N. A. RUSSELL, of the Ocala, Fla., office has been transferred to the superintendent's office at Atlanta, Ga.

J. F. HEARD, division engineer, Southern Division, Atlanta, Ga., has completed the installation of the extensive new telephone equipment at Memphis, Tenn.

MANAGERS APPOINTED: H. Cathey, Ardmore, Okla.; G. D. Criswell, Fresno, Calif., C. W. Kenney, Laurel, Del.; Charles C. Nickels, Monrovia, Calif.; A. V. Ferguson, Joplin, Mo.; F. H. Judd, Fulton, N. Y.; J. J. Bishop, Thomasville, Ga.; G. R. Craig, Fredericksburg, Va.; C. G. Knapp, Nashville, Tenn.; Sarah A. Davis, Dyersburg, Tenn.; Helen Dempsey, Baldwinsville, N. Y.; L. S. Heckendender, Ottawa, Ill.; B. J. Foley, Portland, Me.; G. C. Wood, Goldsboro, N. C.; and C. L. Townsend, Fayettesville, N. C.

New York Operating Department.

TRAFFIC CHIEF T. V. FLYNN is enjoying a two weeks' vacation in the Oranges.

MISS WASHKEWICK, who has been working the 2d Chicago bonus circuit, has resigned, as she is to be married in the near future.

NIGHT CITY CHIEF E. C. LE SEUR, who has been confined to his home for the past several weeks, expects to return to work in a few days.

MISS L. A. MCGREGOR and Miss M. Brown have returned to duty, having recovered from recent illness

AMONG THE GRADUATES from the school in this department now assigned to important wires are Frank Mathews, handling the Richmond local, and the Misses Clifford and Sullivan, working the first Boston wire.

MISS I. DELEHANTY, of the service department, has returned from her vacation.

New York City Notes.

"DA" BRANCH will be moved on May 1 from 702 Washington Street to 520 Hudson Street. Edward T. Flanagan, manager, is enthusiastic over the change and expects to increase his business as a result.

J. FERRARA, chief clerk "BR" office, Twenty-third Street, and Miss Nellie Roy, clerk for the Commercial Cable Company, were married March 27, at Corona, L. I. The couple were the recipients of a valuable wedding gift from the force of the local office.

A. J. DESTAFANO has been promoted to the position of chief operator at "FA" branch, Forty-second Street and Fifth Avenue.

Fifth District Notes.

C. A. RICHARDSON, superintendent, Albany, N. Y., and D. H. Gage, division engineer, were recent Buffalo visitors.

RECENT APPOINTMENTS at Buffalo are Mrs. D. Meyers, Mrs. Louise Vader, T. H. Gibbs and A. E. Crandell, operators; Gertrude McLaren, telephone clerk.

MISS M. L. BILL has been appointed manager of the branch office, 1283 Niagara Street, Buffalo, N. Y.

NEW APPOINTMENTS at Rochester, N. Y., are Florence H. Peterson, stenographer; Mary B. Allen, Ada Stimus, telephone operators; Madeline C. Flick, assistant delivery clerk; and Viola M. Linney, file clerk.

F. H. GUDD, formerly manager at Fulton, N. Y., has returned to the service in his old position.

OTHER NEW APPOINTMENTS in the district are: Helen A. Dempsey, manager, Baldwinsville, N. Y.; F. H. Miller, operator, Elmira, N. Y.; Miss Heath, clerk, Jamestown, N. Y.; Thomas J. Evans, lineman, and J. F. Snyder, clerk, Syracuse, N. Y.; Margaret Dodican, clerk, Watertown, N. Y.

Third District Notes.

A NEW OFFICE has been opened at Laurel, Del., under the managership of C. W. Kenney, who is well and favorably known in Laurel and vicinity. The office is well located and fitted up in standard Postal style.

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F. BURGER, for a number of years operator and assistant to manager C. W. Harman at Hagerstown, Md., has resigned to enter the service of the Western Maryland Railroad Company. He is succeeded by Bruce Beatty, also of Hagerstown, and more recently in the telegraph service at Lancaster, Pa.

Philadelphia Postal.

MISS A. C. BYRNE, manager of the telegraph and mail department, Vim Motor Truck Corporation, has left for an extended trip to California and expects to remain in Los Angeles with relatives for several months. During Miss Byrne's absence Miss K. Connelly will be in charge.

A. L. MCFARLAND, for a number of years in the line department, has been appointed assistant to City Foreman W. M. Fitzgerald.

THE DOT AND DASH CLUB of Philadelphia is to have a spring dinner on the night of May 17, when it is expected there will be a large attendance.

AMONG RECENT VISITORS was Mahlon Kline, of the U. S. Army, former route clerk here; also, Jemes Dennison, of the *Sun-Herald*, New York, on a business trip to Southern cities.

AN ENTERTAINMENT AND DANCE, given by the Electrical Aid Society of Philadelphia, on Wednesday evening, April 7, at Mercantile Hall, Broad and Master Streets, was a grand success, both from a financial and entertainment standpoint. A vaudeville act from 8 to 10 p. m. was enjoyed by all. Dancing followed the vaudeville, from 10 p. m. to 1 a. m., which more than greatly pleased the ladies. Music was furnished by Prof. Charles De Hart's Society Orchestra.

Boston, Mass., Postal.

D. J. LANGLOIS, formerly traffic chief operator, is now in the quadruplex department.

JAMES F. CARTER has been appointed night traffic chief.

HARRY J. FARRAR, eastern traffic chief, is meeting with considerable success as an instructor in telegraphy.

JAMES MULGARI, of this office, has taken a position in the telegraph service of Swift & Co.

MISS MYRA HAMLON, of this office, has gone to Detroit, Mich., where she will be employed in the company's main office in that city.

A. AHERN, formerly at Fitchburg, Mass., has returned to the Boston main office.

J. SNIDER, of the Boston office, has been in Worcester, Mass., during the past month, assisting Manager P. S. Durgin with his ever increasing traffic.

MISS C. A. HENRY, of the main office, has gone to New York, where she will be employed in the general telegraph department.

W. C UPHAM has gone to North Adams, Mass., to act as relief manager.

HENRY C. BENNEN, of the second New York bonus circuit, and who has been laid up on account of illness for a week or so, has returned to duty.

Seattle, Wash., Postal.

H. E. PATTON, superintendent, is on a tour of inspection to offices in Montana, Eastern Washington and Idaho.

THE CABLESHIP *Restorer*, of the Commercial Pacific Cable Company, arrived in Seattle from Midway Island and Honolulu on March 19. Superintendent Butler of the Midway cable station came over on the *Restorer* and is on his way to Ireland where he will spend a six-months' furlough. He is accompanied by Mrs. Butler and their two young sons.

G. E. PILCHER, chief clerk to Superintendent Patton, has returned to his desk after a siege of influenza which he worsted without serious consequences.

BEN S. DURKEE, one of the most popular chief operators in the company's service, and for many years chief operator of the Portland, Ore., office, died in that city on March 12. Mr. Durkee, in the year 1893 journeyed to New York and in the telegraph tournament held there at that time won the John W. Mackay gold medal for expert receiving on a typewriter.

AN EMPLOYEES SERVICE BULLETIN for circulation among the workers in the Second District, Pacific Division, has been started. The management of the Bulletin will be in the hands of G. E. Pilcher and Miss Norma Cade.

A. B. RICHARDS, general superintendent, San Francisco, visited the Seattle district recently.

HENRY WITT has been appointed district foreman at Seattle, D. Ewing has been appointed city foreman in Seattle.

B. MCCUTCHEON, from Detroit, Mich., has joined the operating staff of the Butte, Mont., office.

W. H. TRIGG has been appointed manager of the office at Everett, Wash.

MR. SCHUBERT has been appointed chief operator of the Portland, Ore., office, vice B. S. Durkee, deceased. L. C. Auld, operator, has been appointed night chief operator, relieving Mr. Schubert.

J. WESTLEY HALL, manager at Snohomish, Wash., was a Seattle business visitor recently.

MANAGER SCHULZ, of Seattle main office, recently carried on a competitive campaign among the branch offices, looking to increased receipts. His efforts were highly successful.

J. F. MURPHY, night chief operator of the Tacoma, Wash., office, has returned to duty after having been confined to his home on account of illness.

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NEW ORLEANS, LA.

Big Telegraph Center.

Once in a small mining town in the West a telegraph company was induced to open an office in the place upon the representations of a telegrapher who operated a cigar store there, and who promised, if given the agency, to pile up large traffic. The day the office was opened the manager had all of his friends send paid messages to someone somewhere, wishing them good luck and "many happy returns." The next morning the manager wired the district superintendent as follows: "Business satisfactory. Receipts averaging $300 per day."

What happened the next day, and the next to that, is not recorded except in the memory of the lineman who removed the box relay a month later. The average petered out when the gulch dried up.

The telegraph business of New Orleans has grown to large proportions. The average daily traffic handled, each year shows steady gain.

The reason for this is that the city is not dependent upon small business or upon any one or two lines of industry.

It is a fact that New Orleans has the largest coffee, banana, sugar, rice, cotton, sulphur, and fish business of any city in the United States. New Orleans has the largest oyster market in the world; has the largest grain elevators of any seaport; is 600 miles nearer the Panama canal than any other large seaport, and owing to the excellent harbor facilities available here trade with Cuba, Central and South America, and with Mexico is constantly growing. Also, New Orleans is the metropolis of the south and the winter capital of America.

The Postal Telegraph-Cable Company has in New Orleans an aggregation of business getters, and an operating staff which in efficiency and results produced compares favorably with the best half-dozen offices in the country.

C. M. Holmes, manager of the city district, has had long experience at other offices in the south and is thoroughly familiar with business conditions and stands high with business men of New Orleans and other southern cities. During the time he has been in charge of the New Orleans offices he has built up a loyal and efficient organization.

Mr. Holmes is ably assisted by A. F. Raddenack, assistant manager of the main office.

At the Cotton Exchange office, one of the busiest marts in the country, J. T. Remley, widely known as a telegraph manager, is in charge. The Board of Trade office is managed by Miss Z. Bush, and the Produce Branch by J. J. Bridges. The Sugar Exchange office is under the management of Miss M. L. Witherspoon; the Automobile District branch is managed by A. C. Chastine; the Maison Blanche branch by Miss H. V. Hailey; the French Market branch by George Koepke, and the Grunewald Hotel branch by Miss Z. Hill, days, and Miss A. Culotta, nights.

The operating staff in charge of apparatus and traffic includes the following: L. L. Duyck, chief operator; L. H. Dinkeldein, night chief operator; W. H. Helm, late night chief; J. N. Perry, wire chief; W. Cowland, quadruplex chief; G. J. Holthaus, assistant quad chief; George J. Verges, traffic chief, and C. E. Hogshead, night traffic chief. At the Cotton Exchange E. E. Jackson is traffic chief.

The New Orleans office has perhaps a larger number of Bonus Morse circuits than any other telegraph office in the country. Bonus circuits are operated with New York, Birmingham, Dallas, Chicago, Memphis, St. Louis, Augusta, and other large offices. Expert telegraphers who work these circuits at New Orleans include: John T. Flynn, F. J. Kloor, F. W. Morris, J. N. McHugh, George Kern, George E. Wilkins, Ira Adkins, J. F. Thompson, E. S. Moon, P. J. Broderick, M. A. Laux, C. N. Aprill, F. J. Ebel, A. G. Gadmer, J. J. Holtgreve, George Lebon, E. N. Brignoni, S. B. Metts, L. T. Austin, W. L. James, M. H. Russ, R. J. Kingmill, R. C. Kirst, and B. J. McCullum.

Other operators working fast wires are: A. F. Omalley, J. R. Chaisson, Mrs. M. Holthaus, W. T. Brown, S. L. Berry, H. I. Percy, M. Kuhn, E. H. Alford, L. C. Knight, A. E. Ladet, C. W. Sarrett, A. B. Forbes, sr., A. B. Forbes, jr., N. Cusimano, D. S. Puneky, W. F. Jones, J. A. Silva, J. G. Davis, R. F. Laborne, C. R. Enderle, H. H. Galloway, J. S. Williams, L. C. Dieudonne, F. A. Mitchell, O. F. St Blanc, P. P. Lampiasi and William Foster.

In the clerical department, including delivery and district service, there are thirty-five employees. F. A. Frey is chief clerk and Miss M. Dufaut, cashier.

The plant department is in charge of J. K. Raby, foreman, with William Morton, M. Plunket, L. Woertz and Julius Raby as assistants.

The telephone department is in charge of Miss R. Carson, supervisor, with seven assistants.

"The Night Operator."

Telegraphers who enjoyed reading "The Wire Devils" will welcome this new book by Frank L. Packard. The book contains a number of short stories written about the alluring game of railroading; the first story, "The Night Operator", is also the title of the book.

In "The Night Operator" you will follow with spell-bound interest a panorama of rushing mountain rivers and dangerous curves, of brave men responsible for the safety of others, who meet their obligation with high hearts and abounding courage.

And when the book is read you will recall with delight "Toodles," the spunky little night operator, "Royal Carlton," the big superintendent, "Regan," the purposeful master mechanic, and "Timmy O'Toole," the valorous Irishman, and say to yourself, "Packard has done it again; written another breathless adventure story; I hope he goes on writing them."

The price of the book is $1.50 net. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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OBITUARY.

Death of Thomas F. Clark.

Thomas F. Clark, aged 74 years, vice-president of the Western Union Telegraph Company, New York, who retired from active service seven years ago, died at Colombo, Ceylon on February 7. Mr. Clark left this country for the Far East five years ago intending to spend several years traveling in the Orient. His headquarters were at Yokohoma, Japan. He had also spent much time in China.

Mr. Clark was a native of England, where he entered the service of the Electric and International Electric Company, at the Engineering works, at Gloucester Road, London, and on the assumption of the British Telegraphs by the government, he entered the Postal Telegraph service. In May, 1871, he came to the United States, and soon after his arrival became private secretary to General Thomas T. Eckert, then superintendent of the Eastern Division of the Western Union Telegraph Company. When General Eckert became president of the American Union Telegraph Company, Mr. Clark was elected secretary of that company. On the consolidation of the Western Union and American Union Telegraph Companies in January, 1881, Mr. Clark returned with General Eckert to the service of the Western Union Telegraph Company. In 1882, he was elected secretary of the American Telegraph and Cable Company, and in 1887 of the International Ocean Telegraph Company. Mr. Clark was appointed assistant to the president in 1893 and was elected a vice-president of the company a few years later. He was also a director in many of the telegraph companies comprising the Western Union System.

Mr. Clark had great literary ability and wielded a fluent and graceful pen.

Mrs. Clark accompanied her husband on his trip through the Orient and was with him at the time of his death.

THOMAS F. FLYNN, for many years manager of the West Thirty-first Street, New York, office of the Western Union Telegraph Company, died at his home in Brooklyn on April 2. At the time of his death, Mr. Flynn was sixty-seven years of age. He was a brother of Peter H. Flynn, for many years past manager of the telegraph service in the New York headquarters of the New York *Herald*.

J. P. SHIELDS, in Western Union service, New York, and for some time past assigned to duty in the New York *World* office, died on April 4.

Military Telegraphers' Pension Bill.

David Homer Bates, secretary of the United States Military Telegraph Corps, has been advised by Colonel Thomas S. Crago, chairman of the House of Representatives sub-committee considering the measure, that the bill favoring pensions for Civil War telegraphers has been acted upon favorably and reported to the full committee on Military Affairs of the House of which Julius Kahn is chairman.

"NO ORGANIZATION can continue to be successful unless the leader's support of the subordinate is contingent upon the latter's efficiency, for the continued maintenance in office of an unproductive individual is pure favoratism, and favoratism will wreck the morale of an organization more quickly than any other element of decay."—*Leonard Wood.*

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

BY ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

"The Sword and the Soul."

The above is the title of a new book by Col. W. R. Plum, the veteran telegrapher of civil war fame. The story deals with the adventures during the war of a Union telegrapher who had many hairbreadth escapes, and who performed many ingenious exploits in erecting and maintaining telegraph lines for the use of the Federal military forces.

The story is cleverly written; the plot is absorbing; the book is well illustrated and beautifully bound. $2.00 per copy from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

IN PARAGUAY, during the year 1919, there were 716 kilometers of telegraph lines in use, of which 268 kilometers were put to public use in 1918 and 447 kilometers in previous years. In 1918 there were handled 228,270 telegrams.

Celestial Rates.

Small Boy—"Mother, what are prayers?"

Mother—"Prayers are messages we send to heaven."

Small Boy—"We say ours before we go to bed, so we get the night rate, don't we?"—*Telephone Review.*

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Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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. 9 NEW YORK, MAY 1, 1920 Thirty-eighth Year

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ntelligence in the Delivery Department.

As a telegram is rapidly passed along from the der of the message to the addressee it passes ough many hands and is scrutinized by a num- of pairs of eyes. At the time the message is d with the telegraph company it may be incor- ly addressed without the clerk who accepts the ssage having grounds for questioning the ac- acy of the address. The addressee's name may misspelled: the office building or street address be wrong—even the city or town of destina- given may be incorrect. The clerk who origi- y receives the telegram from the sender is om in a position to detect errors of this nature. Obviously, the task of straightening out errors ddresses, whether due to neglect upon the part he sender of the message, or of mishandling of rs and figures by those in the service of the graph company who handle the message en e, falls upon delivery clerks.

may be the experience of the average deliv- clerk that ninety-five per cent of the telegrams reaching his department are correctly addressed, but in an office where, say, 1000 telegrams per day are received for delivery, this means that during the day fifty telegrams arrive bearing improper addresses. The job of straightening out these tangles is one that calls for the exercise of a high degree of skill in adding, subtracting, or transposing letters and figures so that they will become in fact the correct address of the person or company for whom the telegram is intended.

The article which appeared in our February 16, 1920, issue entitled "The Psychology of Message Delivery," has been widely read by delivery clerks in both large and small telegraph offices, and many clever clerks are now applying the science of deduction in unraveling incorrect addresses.

Recently we reviewed a number of cases where prompt delivery was effected of telegrams received improperly addressed. At Pensacola, Fla., in the service of the Western Union Telegraph Company, Roland Courtney and Joseph Reichman, delivery clerks, have to their credit a number of instances of delivery of such telegrams. At Jacksonville, Fla., Mr. Glover and Miss Bryant, of the delivery department, have scored several successes. At this same office a messenger boy (No. 139) used his brains to good advantage and delivered a telegram to the right party when the envelope carried an incorrectly spelled name. Manager Lines, himself, on one occasion was appealed to by the delivery department in the case of a telegram addressed to "John T. Aboh." He applied his knowledge of Morse to the case and in a moment had the solution: the message was intended for John T. Alsop.

At Miami, Fla., Miss. Elliott, of the delivery department, also has recently effected prompt delivery in a number of cases where messages were received with obscure addresses.

There is not another department in the telegraph service where the application of clear thinking, and a knowledge of the business can accomplish more in the interest of the company and of the telegraphing public than is true of the delivery department.

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MAGNETIC STORMS AS AFFECTING COMMUNICATION CIRCUITS

The magnetic storms—commonly called aurora borealis disturbances—which seriously interfered with the operation of telegraph and telephone lines in the United States and Canada on August 11, 1919, and March 22 and 23, 1920, attracted wide attention because of the unusual severity of the circuit disturbances widely experienced on these two occasions.

On lines running east and west, especially in Canada and the northern states, magnetic disturbances occur frequently, but seldom do they last longer than a few minutes at a time, and it is not always that the currents induced in communication circuits interfere seriously with telegraph or telephone traffic.

The disturbances of August, 1919, and March, 1920, however, were very troublesome, and there is a desire on all sides for information bearing upon the nature of atmospheric electric or magnetic storms, to the end that if possible steps may be taken to reduce the periods of circuit interruption when these disturbances occur.

The disturbance of August 11, 1919, seems to have first manifested itself on wires running east and west of Winnipeg, Man., beginning about 1:30 a. m., rapidly extending to the far west and to eastern provinces. Lines were subjected to currents of varying intensity over a period of twenty-four hours.

On lines centering in Chicago terminal offices the foreign currents became troublesome about 5:30 a. m., and continued to interfere with circuit operation over a period of eight or nine hours. Circuits north, east, south and west of Chicago were seriously affected. In the eastern states lines running north and south were affected to nearly the same extent as lines running east and west. Circuits out of New York extending to southern cities were at times during the day inoperative.

On lines along the New York Central Railroad between New York and Buffalo the disturbing influence was first observed at 4 a. m., August 11, being particularly severe from 10:15 a. m., until 2 p. m. From 2:10 p. m., until 3:25 p. m., there was a cessation of the disturbance which allowed circuits to be operated fairly well. Again between 3:25 p. m., and 4 p. m., these circuits were subjected to varying currents. At 8:55 p. m., for a period of ten minutes the trouble was severe, and again at 12:05 a. m., August 12, gradually disappearing until 5 a. m., when circuit operation became normal.

The engineers of the telegraph department of the New York Central Railroad at New York, made measurements with a voltmeter inserted in various circuits at New York—wires extending westward. At 11:07 a. m., with regular batt removed, a Buffalo wire showed 30 volts negat continuing to drop to a maximum of 60 volts ne tive at 11:07 ¾. Within the following five minu the voltage varied from 60 volts negative to 50 v positive in periods of two minutes, the movem of the needle being continuous—from 60 v negative to 50 volts positive in sixty seconds.

A test made between 11:20 a. m., and 11:27 m., produced the following figures:

11:20 a. m. 40 volts negative.
11:20 ½ a. m., zero.
11:21 a. m., 43 volts negative.
11:21 ½ a. m., zero.
11:22 a. m., 43 volts negative.
11:23 a. m., zero.
11:24 a. m., 83 volts negative.
11:24 ¾ a. m., zero.
11:25 ¼ a. m., 60 volts negative.
11:25 ¾ a. m., zero.
11:26 ¼ a. m., 60 volts negative.
11:27 a. m., zero.

The movement of the needle being continuous.

The Disturbance of March 22.

On March 22, last, wire service, both telegra and telephone, was again seriously interrupted b tween 6:30 p. m., and midnight. The magnetic d turbances on this occasion were accompanied auroral displays of light reflection which were o servable throughout the eastern states and as f south as Philadelphia. In Boston and New Yo the light streamers were of greater magnitude th has been visible so far south in twenty years pa

Observed from New York the light effects fi appeared in the north and northeast, later shifti to the south, remaining predominantly in the sou ern quadrant until late in the evening. At tim the sky was streaked with narrow rays as from searchlight. Then flashes of light appeared, ris and fading away in a spectacular manner. Fo considerable period the shifting lights covered arc of about three-fourths of the sky overhead.

The disturbances in telephone and telegraph c cuits, which accompanied the auroral display, c tinued from 7 p. m., until 11 p. m.

The diagram, Fig. 1, illustrates the variations voltage in telegraph circuits observed by B. Round, chief operator of the Great North We ern Telegraph office at Winnipeg, Man., on Ma 22, between 9 p. m. and 11:55 p. m. The ra was from 200 volts negative to 250 volts posit The variations which occurred at 9:12 p. m., 9

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p. m., 9:28 p. m., 9:28½ p. m., 10.55 p. m., 11:15 p. m., and 11.55 p. m. indicate the erratic characteristics observable in the north.

The voltage recorded on lines at Winnipeg was nearly four times that observed on New York Central lines between New York and Buffalo. The latter lines are approximately 1,000 miles east and 500 miles south of the lines radiating out of Winnipeg.

All of the foregoing is fresh in the minds of wire chiefs having charge of circuit maintenance and operation.

The earth itself is a great magnet, whether of the nature of a lodestone or an electro-magnet is not clear. Scientific investigators have found that about 95 per cent of the total magnetization of the earth is due to an inside potential, the remaining 5 per cent being due to an outside potential and an electric current system traveling the earth perpendicularly to its surface. As to accompanying electrical phenomena it has been stated that there is on the average for the entire earth, for every square mile of surface, a current of one-fifth ampere, passing perpendicularly through the surface, either

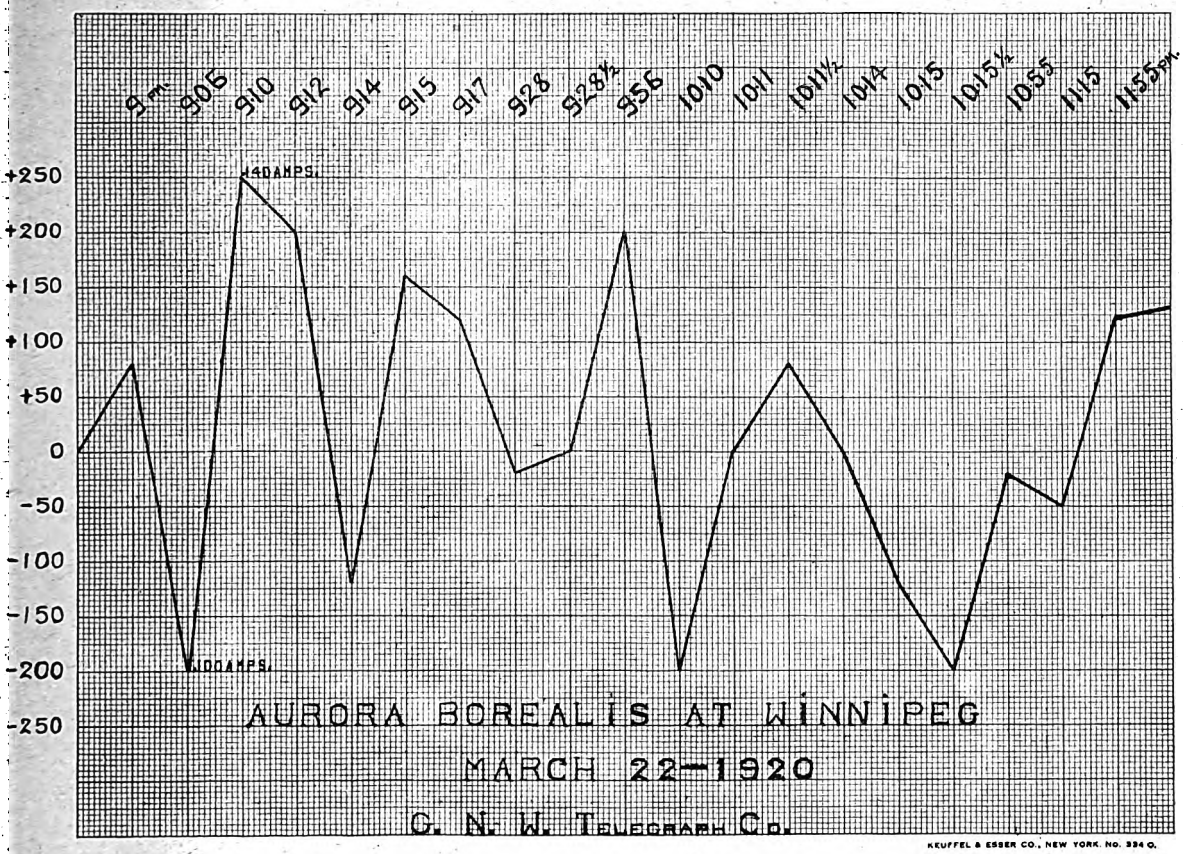

FIG. 1.

ORIGIN OF THE AURORA.

As has been stated by Prof. Swann of the University of Minnesota, it is generally supposed that the aurora is due to light generated by the impact, with our atmosphere, of negative electrons shot out from the sun. The stream of electrons so propagated is not confined to the sunlit side of the earth, since the paths of the electrons are bent in passing through the earth's magnetic field, and some of them enter our atmosphere on the side remote from the sun. Granting that this hypothesis is correct, and remembering that it is an established fact that when electrons strike molecules of matter, rays are produced which have the nature of X-rays, we have for consideration a plausible theory which accounts for many of the effects which accompany auroral displays.

from the air into the earth or vice versa. As this figure is an average it may be understood that there are many spots where the current density is greater than this, and others where perhaps there is no measurable current movement.

The subject of the earth's magnetism and the flow of electric currents normally through the earth, from earth to atmosphere, and atmosphere to earth, ordinarily may be regarded as a subject aside from electro-magnetic disturbances which accompany auroral displays. But the existence of this magnetism and these electric currents should be kept in mind so that one can imagine what takes places in the atmosphere and at the surface of the earth when the electrons shot from the sun strike the matter of the air.

Dr. L. A. Bauer some years ago stated his con-

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clusion that all of the modern magnetic charts unite in indicating the probable existence of vertical earth-air electric currents of the average intensity over the region 45 deg. N. to 45 deg. S. of one thirtieth of an ampere per square kilometer of surface. These currents of positive electricity proceed upward (from the earth into the air) near the equatorial regions where there are ascending air currents, and downward near the parallels 25 to 30 deg.; i. e., in the regions of descending air currents. Near the parallels 40 deg. the electric currents are again upward, thus corresponding once more with the general atmospheric circulation. Beyond the parallels 45 deg. the results appear too uncertain to warrant drawing a definite conclusion.

By means of balloon observations the potential gradient with altitude has been found to decrease from 150 volts per meter at the surface of the earth to about 2 volts at a height of nine kilometers. Investigations made at greater heights very likely would show that at twelve miles, or fifteen miles above the earth the potential gradient normally is negligible.

It is well here to remember that our atmosphere extends upward to a distance of about fifty miles.

Many calculations and measurements made to determine the height of the light ribbons or curtains of aurora show that the average display appears at an altitude between twenty and one hundred miles above the earth.

Undoubtedly electrostatic action takes place between the aurora area in the upper atmosphere and the air strata near the earth charged with current due to earth potentials. Andree found that before the appearance of aurora, the positive electrical potential of the atmosphere diminished abruptly, in some cases even becoming negative. Of course, this same effect is observable when rain falls, but after a rain storm the positive charge in the atmosphere generally returns promptly. When aurora appears the atmospheric potential takes up as before and quite rapidly a high positive electrostatic value.

The normal electrical equilibrium of the earth appears, therefore, to be subject to alterations when aurora effects occur, and the degree of alteration need not proceed far before communication circuits strung along the surface of the earth have their relatively weak currents neutralized, reversed, or increased, and this is exactly what is experienced in the operation of overhead wire lines during auroral displays.

ACCORDING TO AN ITEM in *The Mess Kit*, at a roll-call in a Polish-American regiment, one of the officers sneezed, whereupon five men jumped to attention and answered "here!"

"AN ADMINISTRATOR facing a multiplicity of important problems cannot hope to know more than his assistants about each one of their specialties; presupposing, of course, that these advisers have been selected in a sincere effort to obtain the most competent men available."—*Leonard Wood.*

POSTAL TELEGRAPH-CABLE COMPANY OF TEXAS—DISCONTINUES PUBLIC MESSAGE TRAFFIC.

Effective May 1, the Postal Telegraph-Cable Company of Texas will discontinue handling public message traffic, mainly because on that date the company's contracts with other lines expire.

Renewal of these contracts could not be made on a basis that would leave the Postal Company a reasonable return on its investment in lines and office plant.

This company was organized in May, 1896, and trunk telegraph lines were constructed from Memphis, Tenn., into Arkansas, Oklahoma, Texas and Louisana. For many years after the lines were built the company had exchange traffic agreements with the various Postal Telegraph-Cable Companies operating in other states, known as the Mackay System. This arrangement continued until February, 1910, when, due to control readjustments among the major telegraph and telephone corporations, the Mackay Company decided to build its own lines throughout the Southwest—discontinuing exchange of traffic arrangements with the Postal Telegraph-Cable Company of Texas.

The new lines built and new offices established have been operated under the name of the Mackay Telegraph-Cable Company. Thus during the past ten years the Postal Telegraph-Cable Company of Texas has been one of three competing telegraph companies operating in the Southwestern states, handling a considerable amount of local business as well as business to outside points originating at its exclusive offices and which was transferred to Western Union lines at connecting points, such as New Orleans, La., Memphis, Tenn., and Joplin, Mo.

It is understood that the company has in Arkansas twenty-two exclusive offices, and in Louisiana twenty exclusive offices, not served by other telegraph companies.

The discontinuance of commercial service by the company will release about three hundred employees, including managers, telegraph operators, clerks, etc. For the present the line maintenance forces will be retained, as it is the intention to lease the lines to oil producing companies, and other corporations, who have use for private communication circuits. Most of the employees released will find immediate employment with the other two telegraph companies and with companies operating private wires.

At a meeting and luncheon given in Dallas, Tex., on May 1, all employees of the company who are released and who are entitled to a vacation period during the current year will be presented with a check equal to the pay of the vacation period.

The company has an invested capital of more than $1,000,000, and for the present the headquarters in Dallas will be maintained. Officers who remain in charge of the property are: W. L. Jones, president and general manager; Fred W. Werth, secretary and treasurer; Robert W. Frost, general auditor; E. R. Bennett, superintendent of plant, and H. E. Simms, commercial superintendent.

PRINTING TELEGRAPH SYSTEMS*

JOHN H. BELL
Telegraph Engineer, Western Electric Company, New York

(Continued from April 16 issue.)

RECEIVING. The receiving apparatus of the Siemens and Halske system comprises a distributor with rotating brushes which make one revolution per letter.

One noteworthy feature of the system is the use of storing relays which provide an overlap arrangement.

Fig. 13 shows the line and local relays with the receiving ring of the distributor and the storing relays. The storing relays are polarized and are arranged in pairs as shown. The switch S is reversed mechanically at each revolution so that relays a, b, c, d, and e are connected in sequence to the tongue of the distributor relay for one revolution, and relays a', b', c', d' and e' for the next.

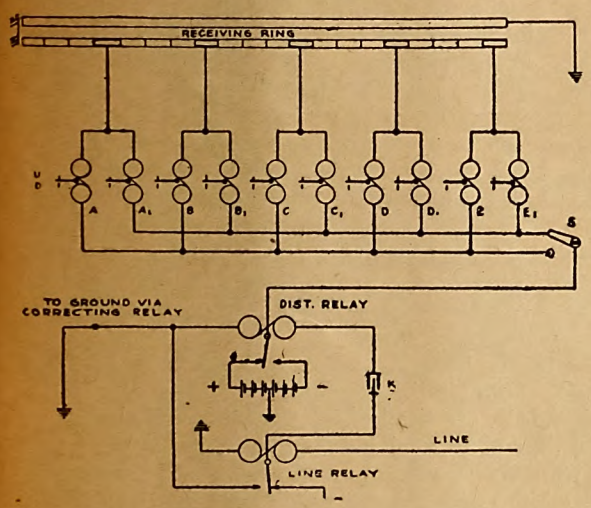

FIG. 13.

The distributor relay is actuated from the tongue of the line relay through the condenser K and follows the movements of the line relay. During the reception of signals forming one letter combination the brush makes one complete revolution. Assuming the armature of the relays move to the "up" or U position when a positive impulse passes, and to the "down" or D position when a negative impulse passes, then a letter combination, say $- + - - +$, would cause the armature of relays b and e to move to the up position and the tongues of relays c and d to the down position. Being polar relays the tongues remain in the position set until reversed by an impulse of opposite polarity.

At the next revolution the next combination could be set up on relays a', b', c', d' and e'. Meanwhile, the set-up on the relays a, b, c, d, and e is used to effect the selection and printing of the previous letter.

Fig. 14 shows the translator portion of the distributor. It comprises six segmented rings. These are connected to the contacts of the storing relays shown in the preceding figure. The tongues of each pair of relays are connected to switches S_1 S_2 S_3 S_4 and S_5, which are reversed once per revolution, the reversal taking place while the brushes sweep over the short blank portion of the rings.

The brushes are mounted on the same shaft as the typewheel and the letters are arranged around the periphery of the typewheel to accord with the code used.

As the brushes sweep over the blank portions of the rings the condenser PK is charged by being connected across the + and — poles of the battery. The operation of the translator will readily be understood by following the selection of one letter. Assume that the switches are in the position shown and that the tongues of relays a, b and e are "up" and those of c and d are in the "down" position as shown in the figure. The segments which are involved in this particular selection are shown in black. It will be seen that when the brushes reach

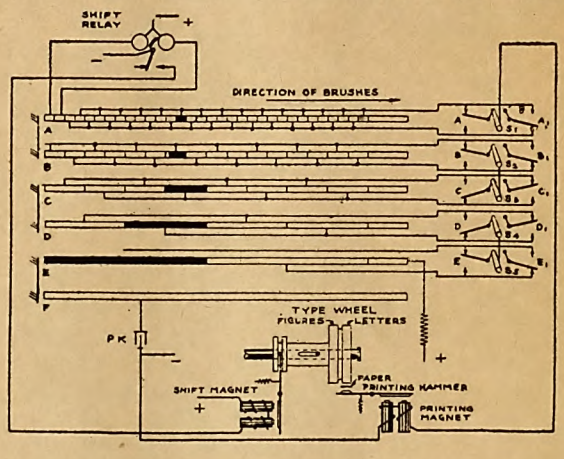

FIG. 14.

segment 14 of the first ring a circuit is provided for the discharge of the condenser PK through the printing magnet. This magnet is actuated, causing the paper tape to be impressed against the typewheel.

The typewheel carries two series of characters, one being letters the other figures and the usual

*Presented at the 8th Midwinter Convention of the American Institute of Electrical Engineers, New York, February 19, 1920.

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punctuation marks. In the normal position the letter series is in position for printing and by sliding the wheel along its shaft the figure series is brought into the printing position.

The positioning of the typewheel for printing letters or figures is effected by a shift magnet which is controlled by a differentially wound polar relay. Two of the 32 segments of the first ring are connected to the windings of this polar relay so that the position of its tongue is determined by the "figure shift" and "letter shift" signals which are transmitted over the line.

Maintenance of Synchronism. Between each of the five short receiving segments of the receiving ring there are three correcting segments as shown in Fig. 15. As the signals are being received by the line relay the brush which sweeps over this ring should be on one of the *C* segments, at the moments when the line relay tongue moves from one contact to the other. Under this condition, the center portion of each signal impulse is utilized for the actuation of the storing relays. If the brush is on an *R* correcting segment it is in advance of its correct position and must be retarded, if on an

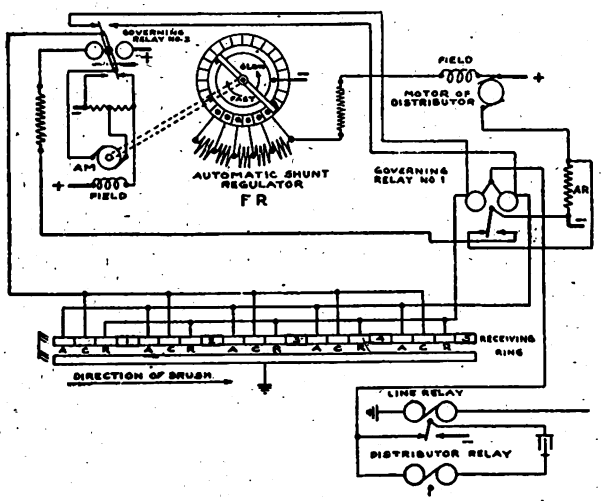

FIG. 15.

A segment it means that the motor has been running slow and must be accelerated.

The speed of the motor which carries the brushes is governed by a resistance *AR* in series with its armature and an atuomatically adjusted resistance *F R* in series with its field winding. If the motors at the two stations are running at approximately the same speed the intermittent shunting of the resistance *AR* is sufficient to maintain synchronism. The field resistance *F R* is used to control wider speed variations.

When the two motors are running in synchronism the operation of the correcting circuit is as follows:

Assuming the armature of the line relay just makes contact with its right-hand contact when the brush reaches the first *C* segment of the receiving ring a negative current impulse will pass through the distributor relay to the mid point of the windings of the No. 1 governing relay, through the left-hand winding of this relay to the left-hand contact and upper tongue of the No. 2 governing relay via contact *C* to ground. The armature of No. 1 governing relay will be moved to the right, thereby closing a circuit from the negative pole of the battery through the No. 2 governing relay and also inserting the resistance *A R* in series with the armature winding. The position of the No. 2 governing relay armature is thereby reversed, so that when the brush reaches the second *C* segment the circuit from the negative pole will be through the distributor relay to the mid point of the windings of No. 1 governing relay, through the right-hand winding of this relay to the right-hand contact and upper tongue of No. 2 governing relay to ground via the second *C* segment. The No. 1 governing relay is reversed, the resistance *A R* is again short-circuited and the armature of No. 2 governing relay which is normally biased is restored to the position shown in Fig. 15.

So long as the brush is on a *C* segment at the moments when the line relay armature is just making contact with the negative battery the armatures of the two governing relays will move from one contact to the other. The resistance *A R* will be cut in and out at each movement of the armature of No. 1 governing relay. The lower tongue of No. 2 relay, which is insulated from the upper tongue, controls the direction of the current through the armature of the small auxiliary motor $A\ M_b$ so that if this lower tongue moves rapidly backward and forward the armature of the motor merely oscillates. If, however, the power connections to this motor remain undisturbed for a few seconds the armature commences to rotate and causes a change in the resistance *F R* which is in series with the field of the larger motor.

Should the brush be on an *R* segment the current impulse through the condenser and the distributor relay will be via the left-hand winding of the No. 1 governing relay to the *R* segment, across the brush to ground. The tongue of the No. 1 governing relay will move to the right opening the shunt across the resistance *A R* and thereby producing a slight reduction in the speed of the motor.

If the brush is on an *R* segment, when the next correcting impulse is generated the two governing relays will remain undisturbed. Consequently, the resistance *A R* remains in circuit. Should this condition continue for several successive revolutions of the brush the auxiliary motor will have time to rotate and to aid in retarding the speed of the motor by cutting out resistance in series with the field.

In the event of the brush being on *A* segments when correcting impulses are generated the No. 1 governing relay armature will move to the left-hand contact and shunt the resistance *A R*, while the position of the No. 2 governing relay will reverse the direction of rotation of the auxiliary motor should the lagging of the brush continue.

The auxiliary motor shaft is connected to the adjustable rheostat arm by means of a worm reduction gearing.

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This system is operated under duplex conditions. Although provision is made for securing a maximum speed of about 160 words per minute the normal working speed is about 120 words per minute in each direction.

MULTIPLEX SYSTEM

Multiplex printing telegraph systems are all based on the Baudot system which was invented in 1875 by Emile Baudot, a Frenchman.

The principle of the multiplex system is illustrated by Fig. 16.

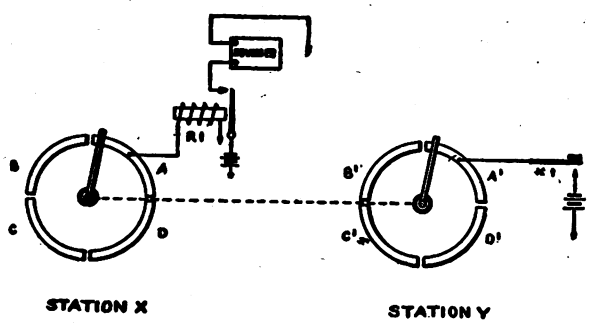

FIG. 16

If two metal rings be each divided into four segments of uniform length, and contact brushes connected by a wire arranged to rotate in synchronism, then segment A at X will be in electrical connection with segment A^1 at station Y, during one quarter of each revolution of the brushes; segment B will be connected to B^1 for a like interval of time and so on. Communication by automatic Morse could be carried on, but it is obvious that the speed of rotation would have to be such as to permit of the longest Morse signal combination being transmitted from each segment. There would consequently be considerable loss of time when sending the short length signal combinations. Transmission of one word per segment would be equally unsatisfactory as words vary in length. Obviously, if there is to be no lost time each signal combination representing a letter or symbol should occupy the same length of time in transmission. In order to obtain sufficient signal combinations to represent the letters of the alphabet it is necessary to divide this time interval into five units and arrange that during each time unit a selecting or non-selecting impulse shall be transmitted over the line. This arrangement will provide 32 possible combinations. By adopting "upper case" and "lower case" characters, as is done in typewriter practice, and arranging that two of the signal combinations shall automatically shift the printing mechanism, so as to print upper case or lower case characters, the number of selectable characters is practically doubled.

In completing this simple arrangement two things are essential:

(1) Means for keeping the two rotating brushes in synchronism.

(2) Means to change the keyboard set-up so as to send a fresh letter combination at each revolution.

Synchronism may be maintained in the following manner:

The brushes are driven by electric motors the speeds of which are so adjusted that the brush at station X rotates slightly faster than that at station Y, say about ¾ deg. or 1 deg. per revolution. When the brushes are started off in synchronism they will sweep over like-numbered segments at the same moment. The brush at station X, however, will gradually gain so that while the Y brush is still on segment 21, brush at X will be on segment 22. When this condition exists an impulse will flow from the correcting battery at Y connected to segment 21 through the correcting relay at X. If it be arranged that the actuation of this relay shall slow down momentarily the speed of the motor at X or else by mechanical means retard the brush, the two brushes will again be in synchronism. By this arrangement the duration of the braking effect can be made proportional to the amount of retarding required.

With the arrangement of segmented rings, as shown in Fig. 17, it will be obvious that, as the brush at the corrected station must be slightly out of phase with the incoming correcting impulses, before correction can take place, it will be out of phase with the incoming signal impulses. Consequently an impulse which should flow, say via segment 4 to the selecting relay connected thereto, may overlap and flow via segment 5 to another selecting relay. The overlapping portion might be sufficient to actuate this selecting relay and thus produce defective selection. This is obviated by using small segments for the receiving ring so that only the middle portion of each signal impulse is utilized to actuate the selecting relays. Fig. 18 shows receiving ring segments of half the length of the sending segments; *a* represents signals in synchronism in which case the middle half of each signal impulse is picked out for actuation of the selecting relays, *b* represents the case where the brushes are ahead of their correct position, and *c* represents the reverse condition. It will be seen that only approximate synchronism is necessary to ensure that the impulses shall be switched to the correct selecting relays.

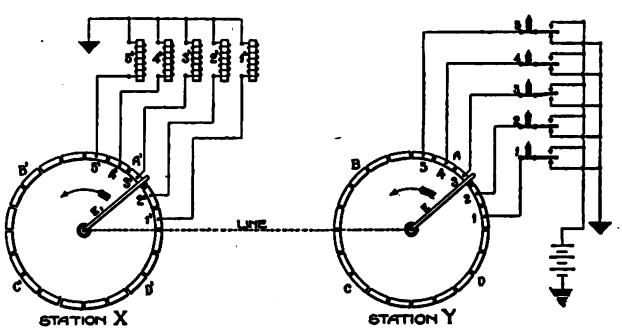

FIG. 17

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This feature of utilizing only the middle portion of each signal impulse is advantageous also in permitting the system to be operated with signals which are considerably distorted. Such distortion may be caused by the electrical characteristics of the line, or by extraneous interference such as induction from other circuits.

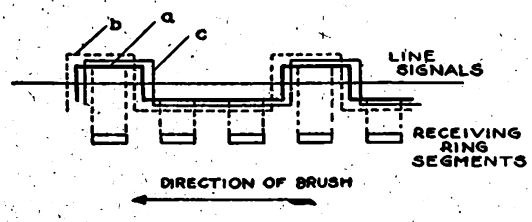

FIG. 18

BAUDOT MULTIPLEX.

The Baudot Multiplex System was invented in 1875 by Emile Baudot, a telegraph operator in the French service. Despite the fact that it was put into commercial operation over forty years ago it held the field against all competitors until recent years

Next to the conception of the multiplex principle as embodied in the Baudot, perhaps the most important development was the doubling of its carrying capacity by adapting it for duplex operation, which was successfully accomplished in 1910 by Mr. A. C. Booth of the British Service.

Other systems, closely resembling the duplex Baudot, and incorporating features borrowed from the typewriter have since been developed, and these are likely to supplant the Baudot in the future. At the present time a large percentage of the telegraph traffic in France is carried by the Baudot system.

Transmitter. Transmission on the Baudot system is effected by means of small keyboards each having five keys similar to piano keys, four such keyboards

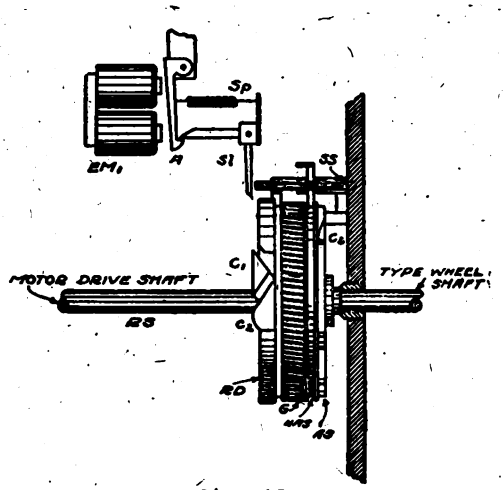

FIG. 19

being connected to a four channel or quadruple set. As the keys are depressed they are automatically locked by small hooks and remain in the depressed position until the brush has swept over the five segments of the sending ring connected to the particular transmitter. An electromagnet mounted in the keyboard is then energized by an impulse through a local ring on the distributor, and releases the hooks, at the same time producing an audible click in the transmitter. This gives a signal, termed the cadence signal, to the operator who immediately depresses one or more of the keys setting up the next letter combination.

Printer. There are several types of Baudot printer, all of which are entirely mechanical except the initial actuation of the selecting magnets. In this paper it is proposed to describe briefly the salient features of the Carpentier type.

In Fig. 19 E M_1 represents one of the five selecting magnets connected to the receiving segments on the distributor. These five selecting magnets are mounted close together so that their armatures A and selecting levers S L are grouped together and

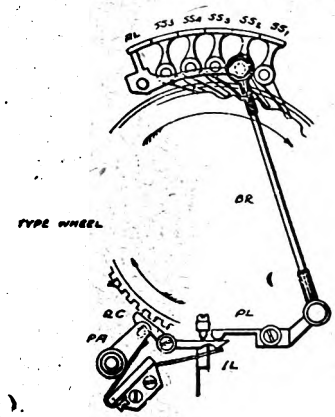

FIG. 20

adjacent to their respective sliding selectors one of which S S is shown in the figure.

When an electromagnet is actuated its armature A is pulled forward releasing the selecting lever S L. As the rotating disk R D moves round a selecting lever which has been selected is caught by the cam C_1, and thereby is caused to press against its corresponding sliding selector S S forcing the toe piece of the sliding selector into the channel marker A S. A selector lever which has not been actuated remains on the left side of the cam C_1, as it passes, so that its sliding selector remains with its toe piece in the channel marker N A S.

Immediately a selecting lever has performed its function of causing the sliding selector to be moved it is restored to normal by the cam C^2 and its upper arm is caught by the armature A.

The rotating shaft driven by an electric motor carries the disk R D, the gear G, the disks N A S and A S and the typewheel. The disks N A S and A S are notched as shown in Fig. 19. A front view of the sliding selectors is shown in Fig. 20. Normally these sliding selectors rest with their heads abutting against each other, irrespective of whether they have been selected or not. As the disks rotate

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notches will pass under their toe pieces, but no movement will take place until a notch is under each toe piece. All toe pieces will then drop into the notches simultaneously, causing the heads to move together towards the right. As the disks continue to rotate the toe pieces will be sharply thrown up by an unnotched portion of the periphery, causing the heads to overshoot and strike sharply against the releasing lever *R L*, (Fig. 20.) Actuation of this lever causes the releasing bar *B R* to pull up the pedal lever *P L* which strikes the intermediate lever *I L*, and removes the retaining pawl from the printer arm *P A*. The printing mechanism is thereby released, the paper tape is impressed against the typewheel, and the desired character printed.

The typewheel has characters on 31/40ths of its periphery, and while the blank portion of 9/40ths passes in front of the printing position the printing arc is restored to normal.

Letters of the alphabet alternate with figures and symbols. When it is desired to print a figure or symbol the "figure shift" signal combination causes the typewheel to be displaced from normal equal to the angular distance between a figure and a letter, so that on receipt of the next signal combination a figure shall be opposite the paper tape instead of a letter. The typewheel is restored to normal by the "letter shift" signal combination.

The speed of rotation of the typewheel must correspond approximately to that of the distributor brushes, and provision for maintaining approximate synchronism between these instruments must be made.

The Baudot system is generally operated at 180 revolutions of the distributor per minute so that an operator sets up letter combinations at the rate of three per second. Assuming six letters per word, this is equal to a speed of 30 words per minute per transmitter or 120 words per minute for the four transmitters. The system may be operated duplex, giving a total carrying capacity of 240 words per minute. One circuit has been in operation for several years between London and Birmingham, giving six channels in each direction—a total carrying capacity of 360 words per minute.

Synchronism. In the Baudot system the brush holder is connected to the motor shaft through gears, and a mechanical device actuated by the correcting relay causes one of the intermediate gears to be rotated one tooth which has the effect of stepping back the brushes with respect to the driving shaft.

MULTIPLEX WITH TAPE TRANSMISSION AND PAGE PRINTING

There are two multiplex systems of this type—the Murray and that developed by the engineers of the Western Union Telegraph Company in the research laboratories of the Bell Telephone System. The Murray system was the forerunner in showing the advantages to be gained by the use of keyboard perforators instead of direct transmission, as in the Baudot system, and in the use of a page printer, which turns out finished messages ready for delivery, thereby eliminating the gumming process.

A two-arm Murray multiplex installation has been in commercial use in England for about ten years. The war, however, prevented the manufacture of further installations; otherwise, it is probable that complete quadruple duplex installations of this system would have been in service by this time.

The multiplex system designed in this country resembles the Murray as regards the use of perforators, page printers, and rotating distributors, but differs from it in many important details. What will be said in this paper concerning the operation advantages of the American multiplex applies generally to the Murray multiplex.

The American multiplex system, like the Murray system, is based fundamentally on the duplex Baudot system, and was developed primarily to meet the needs of the Western Union Telegraph Company. The further development of the American system, providing greater flexibility by means of forking and extending the individual arm or channel, has been developed in the research and developmet laboratories of the Bell System.

This system differs from the Baudot system in the following respects:

Messages are first prepared on keyboard perforators, instead of being transmitted direct from five key transmitters. No special signals are transmitted over the line for the purpose of maintaining synchronism. Messages are printed in page form instead of on tape, thereby eliminating the gumming operation. For a complete quadruple duplex equipment, that is, one which provides for the simultaneous transmission of eight messages—four in each direction—there is required at each end of the line:

Distributor with driving fork and impulse motor
Four transmitters
Four keyboard perforators
Four automatic control units
Four printers
Line and local relays, and duplex balancing equipment.

Messages are first prepared as perforations on a tape, by means of a keyboard perforator as shown in Fig. 21. The perforations for each character are made across the tape and occupy a space of 0.1 in. per letter character. Hence a 30 word message occupies a length of only 18 inches of tape.

Perforator. The perforator comprises three rows of keys arranged according to standard typewriter practice, which control the selection of the punches. The depression of a key, in addition to effecting the selection of a group of punches, causes a circuit to be closed through an electromagnet whose armature drives the selector punches through the paper tape.

Provision is made for back spacing the tape, so that in the event of an error having been made, and observed by the operator, she may cancel it in such

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manner that it does not appear on the printed record at the distant end. For instance, if the word New York is to be perforated, and in error, the *O* key is depressed before the *Y* key as shown at *A*, Fig. 22, the tape would be back spaced and all

Normally each selecting pin tends to move upwards due to a tension spring, *T S*. Only those pins which find a signal hole in the tape, however, are free to rise, the others being held down by the blank section of the tape.

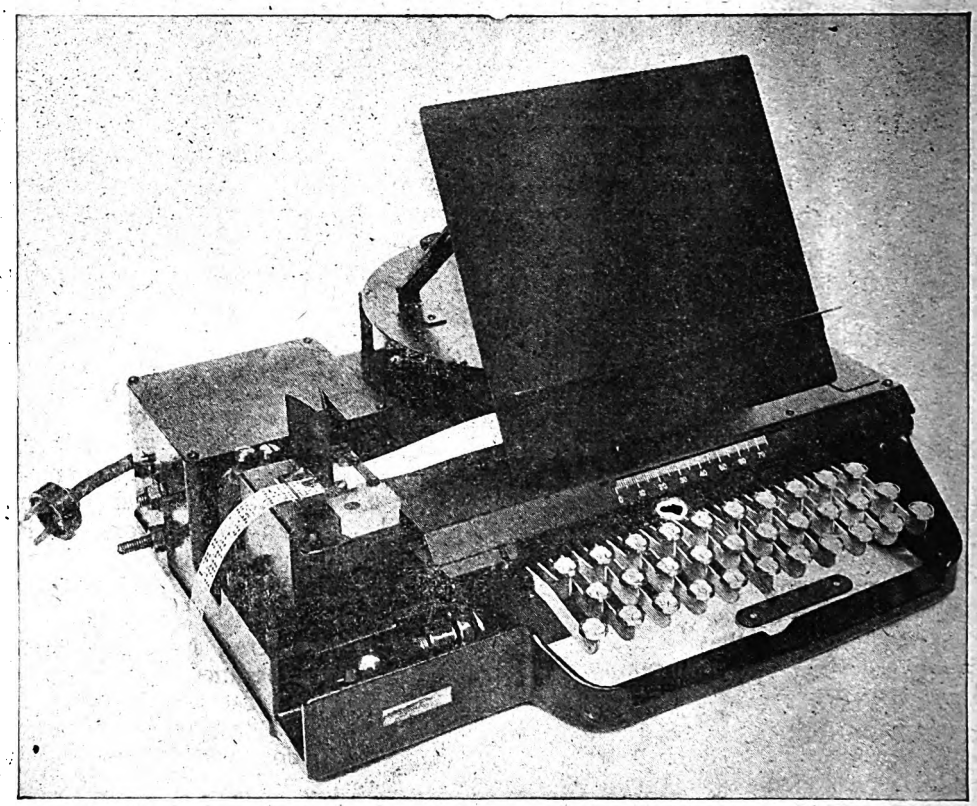

FIG. 21

letters back to and including the *Y* would be cancelled as shown at *B*. Then the word would be continued commencing at the *Y* as shown at *C*. This feature is referred to as the "rub-out" and permits the operator to erase errors from the tape which prevents them from appearing in the printed message.

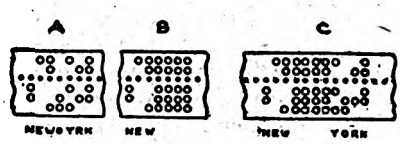

FIG. 22

Transmitter. The transmitter, Fig. 23, has five contact levers, *C L*, insulated, from each other and controlled by five selecting pins, *S P*. The contact levers normally rest against a busbar connected to one pole of the line battery. These contact levers are connected to five consecutive segments on the sending ring of the distributor. When a selecting pin rises through a signal hole in the perforated tape, its contact lever moves over and makes contact with another busbar connected to the other pole of the line battery.

The contact levers associated with those pins which rise through the signal holes move over to the opposite busbar. Consequently, the five segments of the distributor connected to the trans-

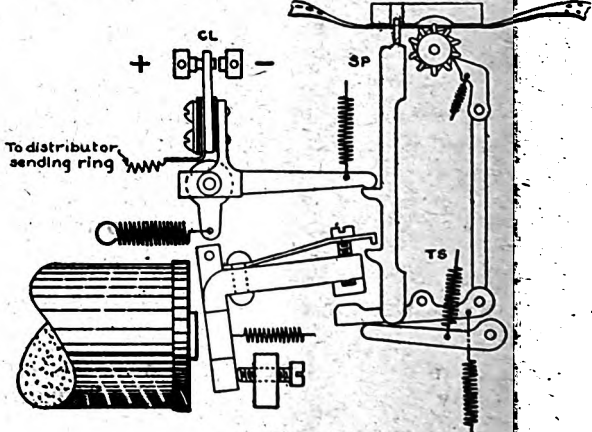

FIG. 23

mitter are placed in contact with one or other of the two poles of the line battery according to the perforations in the tape. As soon as the brush on the distributor has swept over these five segments,

a current impulse which may be termed the "stepping pulse" is made to pass through the electromagnet which depresses all the selecting pins and by means of a ratchet and tape feed wheel similar

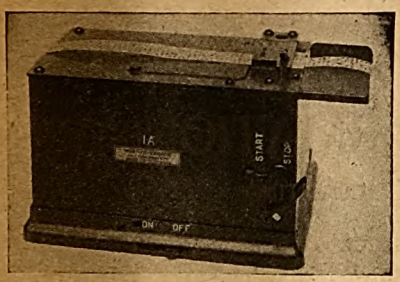

FIGURE 24.

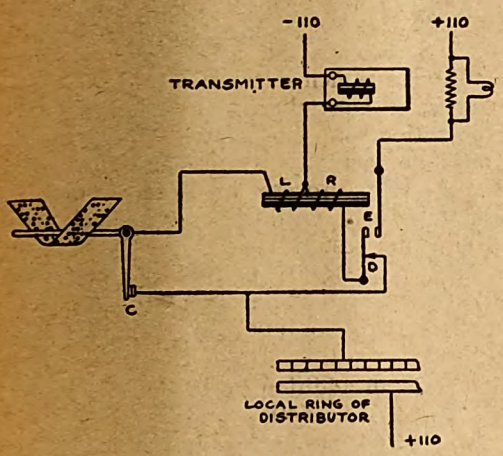

FIG. 25

to that in the perforator, causes the tape to be stepped forward ready for the next letter combination to be set up. Fig. 24 shows the transmitter with covers in place.

(To be continued.)

"The Night Operator."

Telegraphers who enjoyed reading "The Wire Devils" will welcome this new book by Frank L. Packard. The book contains a number of short stories written about the alluring game of railroading; the first story, "The Night Operator", is also the title of the book.

In "The Night Operator" you will follow with spell-bound interest a panorama of rushing mountain rivers and dangerous curves, of brave men responsible for the safety of others, who meet their obligation with high hearts and abounding courage.

And when the book is read you will recall with delight "Toodles," the spunky little night operator, "Royal Carlton," the big superintendent, "Regan," the purposeful master mechanic, and "Timmy O'Toole," the valorous Irishman, and say to yourself, "Packard has done it again; written another breathless adventure story; I hope he goes on writing them."

The price of the book is $1.75 net. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Morse Fast-Sending Tournament Proposed.

As stated on page 200, April 1 issue of TELEGRAPH AND TELEPHONE AGE, it is being proposed that the time is about ripe for holding another National Fast-Sending Morse Telegraph Tournament.

Since the appearance of the article referred to we have received communications from several of the former prize-winners in which each of these gentlemen endorses the idea.

Thomas S. Brickhouse, present holder of the Carnegie diamond medal, which he won at San Francisco in 1915, agrees to place the trophy at the disposal of the committee in charge of the proposed contest. Fred M. McClintic, winner of no-end of medals and silver cups at former tournaments, states that he will lend all the aid in his power to make the meet a success. Daniel A. Mahoney, prominent in the management of other tournaments, and now employed as a traffic chief in the New York main office of the Postal Telegraph-Cable Company, also will contribute assistance if called upon.

So far as TELEGRAPH AND TELEPHONE AGE is concerned we might say that in our belief in order that the meet may be a success it will be necessary to have wide and enthusiastic response to the proposal.

So far, operators employed in radio telegraph service have responded in greater numbers than have land line Morse telegraphers. In radio service there exists a positive need for improved sending, and a tournament would give the stars of the radio field an opportunity to set standards of speed, accuracy, and freedom from superfluous signals, which should redound to the advantage of long distance radio signaling; increasing materially the amount of traffic which may be handled in a given time.

Tape perforators employed in printing telegraph operation, also, should be included in the contest. The skill required in punching transmitting tape is closely akin to the skill required to transmit by means of a Morse key. The operator must be trained in deciphering average copy, and must be able to maintain continuous action at a high rate of speed.

Cable operators will very likely desire to have entries in both hand sending and tape perforating classes, and in tape reading classes.

For the radio trials, Mr. W. A. Winterbottom, traffic manager of the Radio Corporation of America, says he has in view a number of expert radio senders who will set a pace that will surprise land line Morse operators.

Telegraphers in the service of the American Telephone and Telegraph Company, Long Lines Department, announce their interest in the proposed tournament, and it is likely that representatives of that service will be listed among the entries. Messrs. H. J. Kossman and S. Turner, of the Terre Haute, Ind., office, write that they are interested.

TELEGRAPH AND TELEPHONE AGE has had in

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view running a series of articles giving the results at all former telegraph tournaments, with the names of winners in each class, accompanied by photographic reproductions of some of the prize winners, but before doing so we should like to hear from operators as to whether or not this is desired.

We stand ready to give publicity to and lend our aid in any plans that are worked out for holding a tournament.

FOR YOUR INFORMATION

FIGURE SHORT-CUTS IN ACCOUNTING

By Raymond Patrick

Contract Clerk, New Jersey Division, New York Telephone Company.

THE economy of administration essential in a Public Utility Corporation such as ours makes speed a factor in the work of Accounting. But no matter what speed be required, it must not be attained at the expense of correctness. How then may we attain a maximum of both?

A study of the methods by which our present enviable results are obtained brings out the fact that there are two distinct methods employed: first, that of the clerk who is not naturally quick, but who by the application of quick and easy methods more than overcomes this drawback; and, secondly, that of the one who is sufficiently quick in handling purely routine work to permit time for deliberation in figuring and reference work.

SHORT CUTS

The clerk who combines these two qualifications is a notable exception. Just why, it is difficult to determine, but it is probably a natural outcome of the limitation of energy, the mental and physical activity involved resulting in a counteraction.

While most clerks know a few short cuts and occasionally use them they fail to realize that there is a governing principle, which, if applied to the whole of their work, would result in a great saving of time.

It is a simple principle, so simple that its use is an involuntary action of most of us who apply it, and that is doubtless the reason we rarely think of assisting others to its use.

Here it is: *When handling two sets of figures having any bearing upon each other, make whatever analysis you can of each of them at the first glance, and form a mental impression of their proportionate value to any other amount which is easier of computation. The short cuts will suggest themselves without further effort.*

JUGGLING FIGURES

Just a few simple examples. How many of us for instance multiply by 25 in the third grade method? Rather, do we not divide by 4, the result being obtained in hundreds? Yet it is surprising the number of persons who multiply by 2½ simply because they fail to appreciate the principle involved in the previous example—divide by 4 and the result is in tens.

Another value which we use quite frequently is 4½. 36 times 4½ figured the long way will take about 8 seconds, but $36 \times 4\frac{1}{2} = 18 \times 9$ or 9×9 twice, which is twice $81 = 162$.

True, it has taken you 6 seconds to read this explanation, but the habit of applying this method would not actually require any time whatever, as the thought process involved would take place simultaneously with the mechanical work of recording the result.

Again: 16×64 figured the conventional way will take about 10 seconds, but can be arrived at in "less than no time" by the application of this method:

16 is an addition of $10 + 5 + 1$
$10 \times 64 = 640$
$5 \times 64 =$ (half as much) or 320
$1 \times 64 = 64$
The total of these three = 1024

Or: By the process of dropping the last digit:

$16 \times 64 = ?$
$16 \times 6 = (8 \times 12)$ ..... $= 96$
Add the cipher ..... $= 960$
$16 \times 4 = (8 \times 8)$ ..... $= 64$
Total 1024

It takes quite a little time to reduce this to writing, but the time actually required for the mental application of both these methods is only a fraction of that required by the "regular" way. Waste motion is eliminated and the result is proved.

FIGURES NEVER LIE

This example suggests another valuable rule. Never attempt to prove any computation by a mere repetition of the same operation. It is unsatisfactory, inasmuch as it is surprising how frequently one can repeat an error, especially within a short period of time.

Perhaps the effort of the first operation occasionally arrests our vigilance to the extent of causing us to mistake those impressions which are uppermost in our sub-consciousness for a renewal of mental activity, but be this as it may, we are doubtless all cognizant of the fact as the result of repeated experience.

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7 × 60 may be 490, and remain so even after being "verified" by repetition, but 7 × 30 × 2 would expose the error, and even though an error were made in the attempted proof it would rarely produce the same erroneous result.

And then addition or subtraction, 366—79 figured the regular way takes a little time, "a very little," perhaps you say, but consider the case of a bookkeeper bringing down the local message credit on 2,000 accounts, the aggregate time involved is considerable. Now 79 = (66 + 13), 366 — 66 = 300 — 13 = 287; or, 79 + (100—21), 366 — 100 = 266 + 21 = 287. Both these operations are "as quick as thought" and the result being the same it is correct.

AS QUICK AS THOUGHT

In the work of the Bookkeeping Division of the Revenue Accounting Department, no table could be more complete than the fractional charge book. As a time-saver it is indispensable, and yet by the application of a simple rule, and a little effort of memory, its use may be made a good deal less frequent, involving a consequent additional time-saving. The time required to look up a fractional charge is about 5 seconds, whereas this charge may be figured mentally by any clerk while dipping the pen, or by a verification clerk while separating the papers.

For example:

$30.00 per an. = $.08 + per day
$36.00 " " = .10 — " "
12 days @ $30.00 per an. = 12 × .08 = $ .96
12 " " 36.00 " " = 12 × .10 = 1.20

The amount to be added or deducted may be arrived at either by using the actual fraction applicable for each day, or the much more simple method of memorizing the period where the deviation occurs.

Do not misunderstand my reference to memory. I do not advocate trusting to memory for most purposes. The book is for reference and should be used wherever the slightest doubt is felt. Use the book until you are sure of yourself. A little practice, however, and this memorization will resolve itself into a matter of knowledge.

The examples I have shown are few and simple, but I believe sufficient to demonstrate the principle involved.

I believe, too, that their application will result in the development of an analytical attitude toward the work which will make it easier, more interesting, and most of all for our particular purpose, *speedy and accurate.—The Telephone Review.*

"Keep your hand on your pocketbook" is a pretty good admonition when you are in a crowd and the lights go out; but it's a bad practice to keep your hand on your pocketbook too much at other times, if keeping your hand there makes you spend money that you ought to save. Government Saving Stamps are the best plastic for a leaky purse. Save for a Government Savings Stamp.

Electric Storage Battery Company.

On April 26 the New York office of the Electric Storage Battery Company moved from its location at 100 Broadway, which it had occupied for approximately a quarter of a century, to the National Association Building, 23-31 West 43d Street.

In discussing the change of headquarters, Mr. F. L. Kellogg, manager of the New York office, emphasized the fact that the necessity of the move has been brought about by a natural growth in domestic business as well as a rapid increase of the Company's business for export. The new offices provide larger quarters and more adequate facilities for properly taking care of customers' needs.

In connection with this removal, it is interesting to note that The Electric Storage Battery Company with the factory located in Philadelphia, is the largest manufacturer of storage batteries in the world, as well as the oldest manufacturer of storage batteries in this country. The products of The Electric Storage Battery Company are known as the "Chloride-Accumulator", "Exide", "Thin-Exide", "Hvcap-Exide" and "Ironclad-Exide" batteries.

For thirty-two years, The Electric Storage Battery Company has specialized in the building of storage batteries, and, has from its very beginning in 1888, occupied the foremost place in storage battery development in America. Batteries manufactured by this company are used in every field where the application of storage battery power is a factor of importance.

Electrical Education.

A large proportion of the graduates of the large universities which give electrical courses, when they leave college, enter the laboratories of the large industrial companies, and government electrical bureaus.

In the managing, construction and installation departments of operating companies and manufacturing companies there is a growing demand for practical electricians; men qualified to take up the task of getting work done. Telegraph and telephone employees living in towns and cities throughout the country, and who desire to enter the broader fields of the electrical industries, have open to them the thoroughly practical scheme of coming to New York, securing day work or night work in their regular line, and then taking up during their hours off duty a course such as that conducted by the New York Electrical School.

Radio Buzzer Sets.

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $3.50 for the set.

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THEODORE N. VAIL DIES.

Theodore N. Vail, chairman of the Board of Directors of the American Telephone and Telegraph Company, formerly its president and former president of the Western Union Telegraph Company, died Friday morning, April 16, at eight minutes to 6 o'clock in Johns Hopkins Hospital, Baltimore. He was seventy-five years old.

Head of Greatest Telephone System.

As president of the American Telephone and Telegraph Company, Theodore Newton Vail was the head of the largest telephone system in the world. He was not only its nominal head, but he was from the first the genius that promoted the popular use of the telephone, the first man to establish long-distance communication by telephone, and, when past seventy years of age, he was still the initiative head of a system that numbered nine million telephone subscribers and represented an investment of a billion and a half dollars.

Mr. Vail was thirty-one years old when Alexander Graham Bell invented the telephone, and notwithstanding his age he was filling the responsible post of general superintendent of the Railway Mail Service. Still earlier, however, he had been a telegraph operator, and, interested in the possibilities of electrical communication, he had visions that Bell's "toy" would some day be a great factor in American life. Bell and his associates had equal faith in Mr. Vail's organizing genius, for he had already made a name for himself as an organizer in the promotion of the Railway Mail Service, and he was easily induced to resign his government post to become the general manager, in 1878, of the first American Bell Telephone Company.

Even the most optimistic backers of the telephone then thought that the invention would serve only for local communication, but Mr. Vail had visions of its long distance use. It was he who inaugurated successive steps of inter-city communication. The first line from Boston to Providence was ridiculed as "Vail's side show," but some of the persons who indulged in the ridicule at that time lived to see Mr. Vail telephone, not only from Boston to Providence, but from New York to San Francisco, in 1915, thirty-five years later. Further, in October in that year, they found that it was possible to send the human voice more than half way around the world, as was done by wireless telephone from the government station at Arlington, Va., the words being recorded simultaneously at Honolulu, in the mid-Pacific, and the Eiffel Tower, in Paris.

Mr. Vail was known as "the biggest telephone man in the world," not only in tribute to his genius for both mechanical and financial organization, but from the fact that he was personally a man of remarkable physique. He was 6 feet two inches tall and weighed about 280 pounds. With this great physique he had an infinite capacity for hard work and a genial disposition.

Lived in New Jersey.

He was born in Carroll County, Ohio, July 16, 1845, of Quaker ancestry. His father, Davis Vail, removed from Ohio to Morristown, N. J., when the son was four years old, and became associated with a brother, Stephen Vail, who had founded the Speedwell Iron Works, near Morristown, where they built much of the machinery for the first trans-Atlantic steamship. Alfred Vail, another brother, was one of those associated with Samuel Morse in the invention and promotion of the telegraph. Theodore Vail was educated at the old Academy at Morristown, and for a time studied medicine, but becoming interested in the telegraph, he learned to operate the key and went West in 1868 as an operator for the Union Pacific Railroad at Pine Bluffs, Wyo. Pine Bluffs was at that time the principal supply point for wood for the Union Pacific, which had not yet been completed.

Through the friendship of General Grenville M. Dodge, chief engineer of the Union Pacific, Vail, in the next year, was appointed a clerk in the Railway Mail Service, and here his ability to systematize and organize was soon felt. At that time the Railway Mail Service was in an undeveloped stage, and Vail prepared special studies on the question of distribution and dispatching of the mail, which brought him quick recognition from the authorities at Washington. It was just after he had been promoted to the general superintendency of the Railway Mail Service that he acted against the advice of his friends, and accepted the position of General Manager of the American Bell Telephone Company.

Combined Many Lines.

Mr. Vail set for himself the task of making the telephone a universal convenience, and it was on his initiative that every possible improvement was seized upon for the perfection of the service. In 1885, he resigned from the original company and became the first president of the newly formed American Telephone and Telegraph Company, which at first made a specialty of only long distance communication, but which, in 1900, acquired the property of the American Bell Telephone Company and also negotiated combinations with the principal competing telephone companies throughout the country, so that the whole service came largely under a single central administration.

In the meantime, in 1890, Mr. Vail retired from the telephone business for many years. He purchased a large farm at Lyndonville, Vt., and interested himself in agriculture. In 1893 he made a trip to South America and, with his customary foresight, saw the possibilities of the Argentine Republic. He obtained from the government a concession near Cordoba, built an electric power station there, purchased a horse car line in Buenos Aires, converted it into a trolley line, formed a company and equipped it with the best cars from the United States, bought out all competing lines and gave the city a complete modern service. The company was composed largely of British capitalists, and for some time Mr. Vail had his headquarters in London. When he retired from these activities in 1904 he returned to Vermont, but three

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years later he was again called upon to enter the telephone field as president of the American Telephone and Telegraph Company, of which he had been the first president.

The funreal was held on Sunday, April 18, in the Parsippany, N. J., church, the services being conducted by the Rev. George C. Houghton, of the Church of the Transfiguration.

The honorary pall bearers were: H. B. Thayer, George F. Baker, W. Murray Crane, Howard Elliott, Edward E. Loomis, J. C. Tomlinson, Robert Winsor, H. P. Davison, Henry S. Howe, Charles A. Stone, C. F. Adams, George P. Gardner, Lewis Cass Ledyard, John I. Waterbury, Judge W. B. C. Stickney, H. E. Folsom, Senator Henry W Keyes, Newcomb Carlton, John Grier Hibben and Nicholas Murray Butler.

H. G. GREENE has been appointed supervisor of routines in the office of the supervisor of traffic methods, New York Telephone Company, New York.

T. H. LAWRENCE has been appointed engineer in the office of the general traffic engineer, New York Telephone Company, New York.

O. C. MACKNIGHT has been appointed engineer in the office of the supervisor of traffic methods, New York Telephone Company, New York.

A. H. GRISWOLD, engineer of outside plant in the service of the Pacific Telephone and Telegraph Company, San Francisco, Calif., and during the war in Signal Corps service in Europe, has entered the service of the Western Electric Company. He is succeeded as engineer of outside plant by C. E. Fleager.

American Telephone and Telegraph Company.

EARNINGS REPORT FOR THREE MONTHS ENDING MARCH 31, 1920.

EARNINGS:	3 Months 1920
Dividends	$8,570,214.75
Interest and Other Revenues	7,221,899.81
Telephone Traffic (net)*	4,348,314.63
Total	20,140,429.19
Expenses	
Net Earnings	17,800.291.18
Deduct Interest	4,747,845.05
Balance	13,052,446.13
Deduct Dividends	8,839.873.78
Balance	4,212,572.35

*One month estimated.

BELL TELEPHONE SYSTEM IN UNITED STATES

American Telephone and Telegraph Company and Associated Companies in the United States, not including Connected Independent or Sub-Licensee Companies.

EARNINGS REPORT FOR TWO MONTHS ENDING FEBRUARY 29, 1920.

(All duplications including interest, dividends and other payments to American Telephone and Telegraph Company by Associated Companies are excluded.)

	2 Months 1920
Exchange Revenues	$46,988,378
Toll Revenues	22,114,832
Miscellaneous Revenues	880,613
Total Operating Revenues	$69,983,823
Depreciation	11,157,242
Current Maintenance	9,922.818
Traffic Expenses	20,382,418
Commercial Expenses	6,752,854
General and Miscellaneous Expenses	3,076,839
Total Operating Expenses	$51,292,171
Net Operating Revenues	$18,691,652
Uncollectible Revenues	215,592
Taxes	4,684,939
Operating Income	$13,791,121
Net Nonoperating Revenues	1,862,308
Total Gross Income	$15,653,429
Rent and Miscellaneous Deductions	884,082
Interest Deductions	5,020,823
Total Deductions	$ 5,904,905
Balance Net Income	$ 9,748,524
Deduct Dividends (estimated for two months)	6,628,563
Surplus Earnings	$ 3,119,961

Note:—Comparison of above results with those for similar periods last year are not shown as properties were then under Federal control.

IF OVERALLS AND JUMPERS become the standard male garb for street and office attire it may become difficult to distinguish a cashier from a lineman.

A SIGNAL CORPS MAN just returned from Europe, says this overalls craze may be a new thing in this country but that in Germany *deutschland uber alles* has been the rage for years.

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SUBMARINE CABLES

GEORGE GRAY WARD, vice-president and general manager of the Commercial Cable Company, New York, accompanied by his assistant, John Goldhammer, is in Cuba, arranging for additional cable facilities to handle the company's increasing business between American and Cuban cities.

HARRY WILSON, for many years superintendent of government telegraphs in Jamaica, is at the present time on a visit to the United States. He has been a resident of Kingston, Jamaica, for forty years.

AT NORTH SYDNEY, N. S., cable station of the Western Union Cable System there are 222 employees.

J. BRAMOSO, well known telegraph engineer and electrical expert, formerly and for many years identified with the Central and South American Telegraph Company at Buenos Aires, but for the past ten years in other business at Cordoba, Argentina, now occupies a position in the government telegraph service at Maldonado, Uruguay, S. A.

South American Cable Extension.

The All America Cables announce the opening of their new cable to Arica, Chile, and the new land lines from Arica to La Paz, Bolivia, establishing direct communication to Arica, Tacna, La Paz and Corocoro.

Cable Traffic Across the Pacific.

The Bureau of Foreign and Domestic Commerce of the United States estimates that one million words were transmitted across the Commercial Pacific Cable Company's cable lines between San Francisco and the Far East in the year 1914; four million words in 1917 and five million in 1919. All these messages were transmitted, of course, to Guam and relayed from there either to Manila or Japan.

Submarine Cable Testing.

We have received a supply of "Darby and Fisher's Students' Guide to Submarine Cable Testing," fifth edition, one of the most popular books on this important subject.

The book contains 240 pages and deals with all tests and measurements made in modern submarine cable practice. An appendix is included which contains answers to all questions presented in the main work.

The price of the book is $4.50 and copies may be had from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

First Woman Cable Operator in Commercial Cable Company's Service.

During the year 1917 the needs of war took away many of the Commercial Cable Company's operators. It became necessary to enlist the aid of girls and women if the service was to be maintained at its customary high efficiency.

The accompanying photographic reproduction is of Miss Ursula Roche, who arrived in New York from her native country, Ireland, early in the year 1917. Miss Roche's mother was employed in the post office at Newcastlewest, Ireland, and the young lady early in life took a keen interest in the telegraph service. When, therefore, she arrived in America she found that to be in the postal service and at the same time in the telegraph service was out of the question. The next best thing, in her estimation, was to procure employment with the Postal Telegraph-Cable Company, which she did, and was assigned to work in the main office, New York.

URSULA ROCHE, OF THE COMMERCIAL CABLE CO.

The young lady's close application to duty, her promptness and reliability, attracted the attention of Chief Clerk Arthur F. Kavanaugh, with the result that later on, when the Commercial Cable Company called for recruits, she was selected for a place in the cable company's training school. At the cable office Assistant Superintendent, now Superintendent, W. G. Wenman took the girl in hand, and within a short time she showed marked progress in the intricate work of cable operation.

To make a long story short, Miss Roche was, on April 1, appointed to a position on the permanent operating staff, doing the work with the expertness of an old-timer—a credit to herself and to the company.

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Radio Telegraphy

Radio Corporation of America Notes.

A RECEPTION AND DANCE was given at the Belmar, N. J., radio station by the Belmarconi Club on Saturday evening, April 24. There was a large attendance and the party was a success.

MISS F. TRIMARCK has been transferred from the head office in the Woolworth building to the Broad Street office as stenographer to the superintendent.

MISS FLORA SHROEDER of the treasurer's office has resigned from the service.

G. M. USSELMAN has been transferred from the New Brunswick, N. J., station to the station at Marion, Mass., as assistant engineer in charge.

W. C. DURHAM has been transferred from the New Brunswick station to the station at Chatham, Mass.

J. M. BRECKENRIDGE has been appointed chief steam engineer at the Tuckerton, N. J., station.

A. F. VAN DYCK has been transferred from the head office to the factory at Roselle Park, N. J.

JOHN SHERMAN has been appointed clerk at the New Brunswick station, vice Samuel Siegel, resigned.

EUGENE GALE and FRANK LAYTON have been assigned to duty in the power plant at Tuckerton station.

WESLEY HIGGINS has been appointed chief rigger at the New Brunswick station.

W. H. STAPLETON has been appointed clerk in the auditing department, executive offices.

Railroads in England Use Wireless Telephone

When the great railroad strike of September and October, 1919, in England became imminent the government arranged for the installation of a number of radio telephone outfits at railroad terminals in order to guard against interruption to communication in case regular wire service was interrupted.

Stations were set up at Leeds, Rotherham, Derby, Leicester, Birmingham, Wellingboro and St. Pancras; the greatest distance covered being between Leeds and St. Pancras—170 miles.

Marconi one-half kilowatt radiophone sets were used. As these sets carry their own source of current supply the equipment for all stations was installed and ready within twenty-four hours after the order was placed. Satisfactory continuous communication was maintained between the railroad centers as long as the emergency lasted.

I. R. E. Gold Medal for 1920.

The Institute of Radio Engineers' Gold Medal for the year 1920 has been awarded by the Board of Direction of the Institute to William Marconi.

Long Distance Radio Telephony.

The experiments of Robert F. Gowen, engineer in the service of the De Forest Radio Telegraph and Telephone Co., New York, have attracted wide attention. At his home in Ossining, N. Y., about forty miles from New York City, Mr. Gowen maintains a laboratory from which in the evening he conducts radio telephone tests with points at various distances from Ossining. Amateur radio operators in the vicinity of New York have on many occasions during the past five months heard Mr. Gowen talking by radio with the De Forest factory in New York, and with other stations further away. Speech transmitted from Ossining has been heard clearly in Chicago, and also as far west as Topeka, Kansas.

The transmitter consists of a De Forest one-kilowatt oscillion outfit, designed to operate on wave lengths of from 500 to 1000 meters. Two one-half K. W. power tubes are employed, the plate current being supplied from a motor-generator turning out 1500 volts. The modulating circuit used was designed by Charles V. Logwood, of the De Forest Company.

Transmission takes place each evening about 11 o'clock.

OWING TO CABLE CONGESTION between stations in England and Holland, the Netherlands Chamber of Commerce in London has asked the Marconi Company to report on the possibility of inaugurating a wireless telephone service between the two countries.

IT IS REPORTED that successful wireless telephone conversation was carried on during the first week in April between Chelmsford, England and a station in Rome, Italy. According to Marconi officials other radiophone tests have been carried on successfully over ranges of 1500 miles.

IN JAPAN the estimates for wireless expansion in the national budget for the coming year provide for the replacement of the transmitting and receiving apparatus at the Funabashi station.

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Canadian Telegraph Items

Great North Western Telegraph Company.

J. B. THOMPSON, formerly automatic chief at Montreal, has been appointed supervisor in charge of automatics, with headquarters at Toronto.

THE ANNUAL TRAFFIC DEPARTMENT CONVENTION of the Great North Western Telegraph Company was held on Friday and Saturday, April 2nd and 3rd at the King Edward Hotel, Toronto.

Those in attendance were: Guests, J. R. Palmer, automatic inspector, Eastern Division, Western Union Telegraph Company; E. Kenward, supervisor of telegraphs, Canadian National Railways, Toronto; head office officials, Geo. D. Perry, general manager; A. C. McConnell, secretary and auditor; Chas. E. Davies, traffic superintendent; W. J. Duckworth, plant superintendent; Geo. Watt, superintendent of supplies; H. K. Clark, chief electrician; C. C. Stewart, traffic supervisor; Geo. T. Trowhill, supervisor of wire service; J. B. Thompson, supervisor in charge of automatics; E. G. Hunter, chief clerk, general manager's department; John Sullivan, commercial supervisor; Miss K. Livingston, chief clerk traffic department; district superintendents, L. S. Humes, montreal; W. G. Barber, Toronto; J. G. Davies, Winnipeg; G. H. Stead, Saskatoon; George Hogarth, commercial manager, Toronto; managers, J. E. McCann, Montreal; F. D. Boomer, Ottawa; C. W. Dawzy, Toronto; chief operators, R. F. Kenyon, Quebec; G. Sallaway, Montreal; R. J. Daley, Ottawa; G. H. Walters, Toronto; E. C. Menger, Hamilton; T. R Beechey, London; B. S. Round, Winnipeg; A. A. Rogers, Saskatoon; H. C. Milne, Edmonton; A. L. Mallory, Calgary; night chief operators, S. R. Ohlke, Ottawa; G. D. Matthews, Toronto; W. J. Pitfield, assistant chief operator, Toronto; plant chiefs, G. H. Bedford, Montreal; J. B. Rogers, Toronto; Geo. L. Thompson, wire chief, Toronto; automatic supervisors, A. F. Connery, W. T. Sallaway, Montreal; R. C. Barker, C. C. Hamilton, Toronto; automatic routine supervisors, Miss Q. Smith, Montreal; Mrs. E. P. Chambers, Toronto; Miss E. Shortt, telephone supervisor, Toronto; service supervisors, N. A. Guerin, Montreal; Geo. Joliffe, Toronto; Morse operators, H. J. Best and P. Glynn of Toronto, and A. Robinson of Winnipeg.

An illustrated address was given by J. R. Palmer, which proved very interesting and instructive, dealing with the theory and operation of the multiplex.

A general review was made of the past year's operation and many features of the service were enthusiastically discussed, including proposed installations and extensions.

All present attended a banquet and entertainment on Friday evening, in the Louis room of the hotel. The table was appropriately decorated with a miniature telegraph line and stations, electric novelties, flowers and flags. Telegraph insulators for drinking glasses, arranged in wire holders, furnished a suitable color effect.

Following the toasts and the singing of many popular hits, a very commendable entertainment was presented by Messrs. Geo. T. Trowhill, Geo. L. Thompson and Miss A. Ross.

Canadian Telephone Bonds.

A syndicate composed of Lee Higginson & Co., Harris Forbes & Co., and the Royal Securities Corporation, Ltd., has purchased $5,000,000 7 per cent. bonds of the Bell Telephone Company of Canada, dated April 1, 1920, and due April 1, 1925.

Good Book on the Telephone.

"THE PRACTICAL TELEPHONE HANDBOOK AND GUIDE TO THE TELEPHONE EXCHANGE," by Joseph Poole, has been revised and brought up to date in a 1918 edition. This work contains 724 pages of detail information in regard to all phases of telephone operation. Particularly timely chapters are those describing trunk-line working; underground lines; line loading; multiplex telephony, and submarine telephone cables. The price of the book is $5.00

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

BY JACKSON AND BLACK

And we can highly recommend it to our readers.

$2.50 per copy.

From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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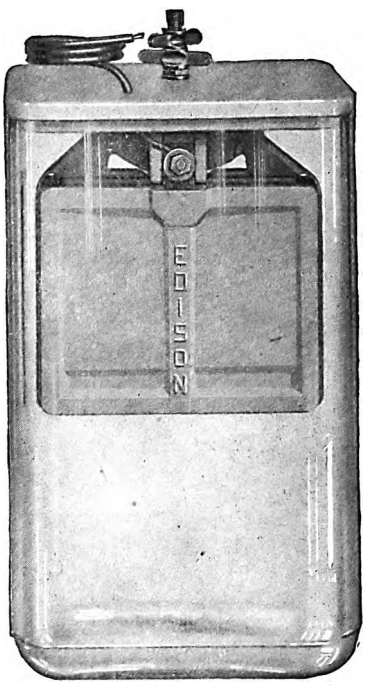

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THOS. A. EDISON, INC.

BLOOMFIELD, N. J.

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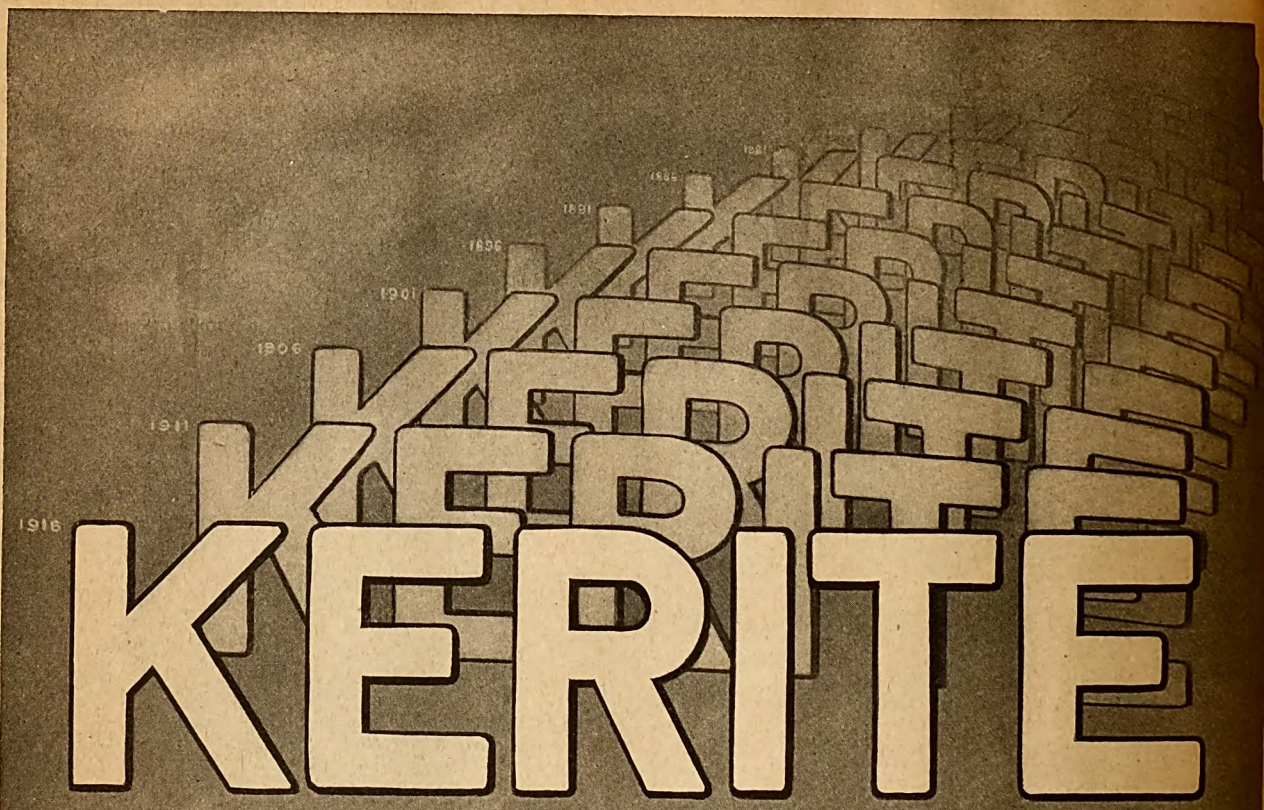

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THE RAILROAD
TELEGRAPH AND TELEPHONE

Toledo and Ohio Central Railroad.

Effective April 1, the jurisdiction of C. W. Bradley, superintendent of Telegraph, and Charles Stephens, signal engineer, of the Chesapeake and Ohio Railroad, headquarters at Richmond, Va., has been extended to include the Hocking Valley Railroad, succeeding B. J. Schwendt, superintendent of telegraph and signals. Mr. Schwendt is superintendent of telegraph and signals of the Toledo and Ohio Central Railroad, Zanesville and Western Railroad, Kanawha and Michigan Railroad, and Kanawha and West Virginia Railroad, and since November 1, 1918, in charge of the telegraph and signal department of the Hocking Valley Railroad.

Effective April 1, the jurisdiction of C. M. Marker, inspector of telegraph and telephone of the Hocking Valley Railroad, has been extended to include the signal department of the same railroad, and his title changed to supervisor of telegraph, telephone and signals.

W. R. BIRT has been appointed supervisor of traffic, telegraph department, Southern Pacific Railroad, effective April 1.

$5.000 Cash Prize Contest for Columbia Batteries.

The National Carbon Company, Inc., of Cleveland, Ohio, has designated the month of May as "Hot Shot Battery Month", and during this period they are stimulating the interest of dealers by offering $5,000 in cash prizes for the best window displays of Columbia Hot Shots. There will be 124 prizes in all, ranging from $25 to $200, and it is expected that many original and effective displays will be made. Awards will be made from photographs submitted, and the judges will be well known advertising and window display experts.

The Motorboat Campaign began in April and will extend through the open water season. This will feature the Columbia multiple battery which, being sealed in a waterproof metal container, is especially designed to prevent ignition difficulties afloat. The advertising will be stressed in motorboat journals and the newspapers of cities where water life is a part of pleasure and profit. The same story will be told by billposting in some 500 United States and Canadian cities that border on the water. In newspaper advertising motorboat owners will be told the names of local dealers who carry the Columbia multiple battery.

A campaign is at present stirring up the householder to put in new batteries for doorbell and dining-room buzzer during the Spring housecleaning. This is to create a demand more especially for the No. 6 Dry Cell, but it will also sell Columbia Hot Shots for opening apartment house doors and other work demanding more cell-power. This campaign will be concentrated in centers of population, and the magazine advertising is supplemented with that in newspapers and on billboards.

The Vacation Campaign will run through June, July and August. On account of the large amount of juice packed away in the Hot Shot, it is just the battery to use with a portable lighting system in the summer camp. The campaign will cover the nation's vacation centers.

Later in the year there will be another farm power campaign, when the farmer is filling his silo, cutting wood, and using his stationary gas engine and tractor for the myriad things he must do before snow flies. Last of the seasonal campaigns is that which will sell Hot Shots and No. 6's for Christmas tree lighting and the operation of mechanical toys.

A campaign began in March, and will run through the year, to educate Ford owners up to the fact that, with a Hot Shot Battery hitched to the engine, it will not be necessary to give more than one turn of the crank to start it. A battery of special size to fit under the seat has just been made for Fords.

"REMCO"

ALTERNATING CURRENT SELECTORS

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Tested and Proved

Manufactured only by the

RAILWAY ELECTRIC MANUFACTURING CO.

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Students' Course in Technical Telegraphy

No. 4.

Before we pass on from the consideration of series and multiple connections it may be well to present two or three illustrations showing generators of electricity connected in series and in multiple, and in this instance when we speak of generators it is understood that a generator may be either a single cell of battery, such as a dry-cell, or a machine generator, such as a dynamo.

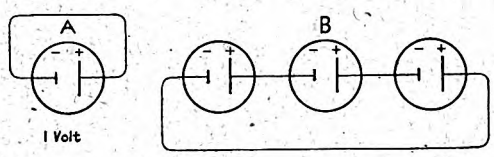

FIG. 10

Figure 10, at *A*, shows one cell of battery joined by a wire connecting its positive pole (carbon) to its negative pole (zinc.) At *B*, is shown three cells of battery connected in series. It may be noted that the positive pole of one cell is connected to the negative pole of the cell next to it, and so on, in *series*.

As was stated in Lesson No. 1, "the practical electrician must know how much current and how much resistance, or he knows nothing," and at this point in our study it may be well to introduce the subject of *resistance* and *current*.

Assume that you have a small electric motor which the dealer says will operate with the current supplied by one dry-cell. Suppose the motor requires one ampere of current to operate it, and that the dry-cell has a voltage of one volt. This means that the *resistance* of the wire in the motor, the wires connecting the motor to the battery, and the resistance of the battery itself total one *ohm*. In this case the resistance is one ohm, the current one ampere, and the electric pressure one volt.

Suppose, now, that in the course of a day or so the motor will no longer run, although the wires connecting it to the battery are still properly connected. This may mean that the dry-cell is partly played out and that it no longer yields one volt. Consequently, it cannot cause one ampere of current to flow through the one ohm resistance, so that the motor no longer receiving its required one ampere of current cannot operate.

It is possible, of course, that the battery is still in good condition and that it still produces one volt of electric pressure. In this case very likely the resistance of the circuit has in some manner been increased beyond one ohm. Possibly a wire connection has become loose in one of the battery or motor binding-posts. This poor contact may have increased the total resistance of the circuit to, say, two ohms—the added one-ohm resistance being in the loose connection. If this is so then the one volt pressure applied to a resistance of two ohms yields but one-half ampere of current—insufficient to operate the motor.

An experience of this kind with a small electric motor and a dry cell teaches us the elements of *Ohm's Law*. According to this Law if the resistance of a circuit is one ohm and the voltage applied is one volt, then one ampere of current will flow in the circuit thus formed. If a pressure of ten volts is applied to a circuit containing one ohm resistance, ten amperes will flow in the circuit. If one volt is applied and the resistance is ten ohms, then one-tenth ampere will flow in the circuit.

In telegraph, telephone, cable, radio, and other electrical work *resistance* is represented by the letter *R*, meaning ohms; the current is represented by the letter *I*, meaning *amperes*, and the *voltage* by *E*, meaning *volts*.

If the voltage is known, and the resistance also is known, then we may find the current strength by dividing the voltage by the resistance. For instance: suppose a telegraph sounder has a resistance of ten ohms, and the generator connected to it a voltage of five volts, then, by Ohm's Law

$$I = \frac{E}{R}$$

E (5) divided by *R* (10) equals one-half; or, the current flowing through the sounder is one-half ampere.

Other current and resistance calculations may be made by means of this simple formula, and the following two formulas:

$$R = \frac{E}{I}$$

$$E = I \times R.$$

Using the second formula, suppose we know that the voltage of the electric light circuit in our homes is 110 volts, and that the current flowing through a certain type of electric lamp is one-half ampere. Then, by dividing 110 by ½ we learn that the resistance of the lamp is 220 ohms.

Using the third formula, suppose that a wire

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chief finds that in a main line circuit there is a current of one-tenth ampere and that the resistance of the circuit including line wire and relays is 1,000 ohms. By multiplying 1,000 by 1/10 he may learn that the voltage applied to the wire is 100 volts.

Referring now to Fig. 10. The single cell may be regarded as having an electrical pressure of one volt, and the three cells on the right a total voltage of three volts. The cells are connected in series.

FIG. 11

Fig. 11 shows six cells of battery connected in *multiple*. In this case the cells have their positive poles all connected to one side of the circuit and their negative poles connected to the other side of the circuit. Cells connected in multiple, in the manner shown, produce in the connected circuit a total voltage equal to the voltage of one cell only. And here we might devote a few words to an explanation of why cells of battery, or machine generators, are at times connected in multiple instead of in series.

Suppose it is found that the small battery motor, previously referred to, will run satisfactorily thirty minutes before the single cell of battery supplying the current becomes exhausted. The thought occurs that if additional cells of battery are added to the circuit the motor may be made to run one hour or two hours without stopping. This assumption is correct, but it would not do to connect the additional cells all in series; for, if there are available six cells in all and they are connected in series —as the three cells in Fig. 10 are connected—we would have a total voltage of six volts, while the operation of the motor requires the application of but one volt pressure. Obviously, if when the single cell becomes exhausted permitting the motor to stop running, replacing the exhausted cell with a fresh cell will run the motor an additional equal period of time. Therefore, if the six cells are connected in multiple as shown in Fig. 11, the motor will run approximately six times as long as when but a single cell is connected to it. Another viewpoint is that if one cell will run the small motor thirty minutes, six cells connected in multiple would run six motors of the same size and type thirty minutes.

MULTIPLE-SERIES CONNECTION.

Suppose that a larger motor is substituted, making the total resistance two ohms, and requiring two amperes of current to operate it instead of one ampere. It is plain that one cell supplying one volt

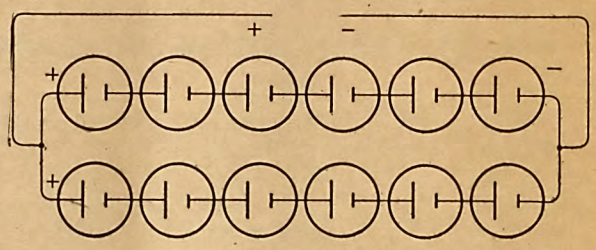

FIG. 12

will not furnish two amperes current through a resistance of two ohms.

Ohm's Law, third formula, here tells us that the voltage necessary to supply 2 amperes of current through a resistance of two ohms is $I \times R$, or 2×2, which equals 4 volts. Therefore, it is necessary to connect four cells in series to furnish this voltage, and if it is desired to have the motor run twice as long as four cells in series would run it there should be an additional four cells connected in *multiple-series*, in the same manner as the six cells are shown connected in Fig. 12. In that diagram there are two series of six cells connected in multiple-series.

Students should understand that so far as current, resistance, and voltage calculations are concerned, in general it is immaterial whether motors, electric bells, telegraph sounders, or relays are referred to. Ohm's Law calculations hold true for all ordinary direct current circuits, and by direct currents we mean continuous current such as that from primary batteries, storage cells, or direct current dynamos.

The author of this series of lessons desires that students review each paper thoroughly, so that in the course of time when examinations are held, each reader will be able to make a good showing in the tests.

(To be continued.)

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY

NEWCOMB CARLTON, president, spent two or three days in Washington during the week of April 18.

F. E. D'HUMY, central office engineer, New York, returned on April 26 from a business trip to the Pacific coast.

E. R. SHUTE, traffic costs engineer, in Vice-President Fashbaugh's department, has returned from an extended trip throughout the West in connection with traffic affairs.

LOUIS CASPER, general inspector, traffic department, is in North Sydney, N. S., in connection with cable traffic matters.

M. F. BRIDGES, division traffic inspector, Dallas, Tex., is in New York, where he will remain several weeks familiarizing himself with late improvements in methods.

A. H. MORGAN, of the engineering department, New York, is in Dallas, Tex., in connection with new office work.

W. V. MCGINNISS, of the engineering department, is in San Francisco on a business mission.

A. H. RICE, of the Delaware and Hudson Railroad, was a recent executive office visitor.

ALLAN WOODLE, city superintendent, Buffalo, N. Y., who has been absent from duty for several weeks on account of illness, is reported recuperating satisfactorily.

G. T. BUTTS has been appointed assistant manager of the office at Hartford, Conn.

THE FIFTH ANNUAL DINNER of the Western Union Bowling Association was held at the Arkwright Club, 320 Broadway, on April 22. About 125 pin experts were present, and thirty prizes were distributed to successful contestants in recently played games. After the awarding of the prizes a high class entertainment was put on consisting of vocal and instrumental music. Mr. F. W. Lienau presided. An interesting feature of the meet was the presentation to Mr. G. Green, division auditor, by his team of a gold medal as a reward for his interest in the team's work during the past season. This team won first place in the series.

RECENT APPOINTMENTS: L. C. Carman, manager at Poughkeepsie, N. Y., has been transferred to the managership at Hornell, N. Y.; G. H. Card, formerly manager at Syracuse, N. Y., has been appointed manager at Poughkeepsie; Nellie Langley, appointed manager at Nyack, N. Y.; Mabel G. Bump, manager at Mechanicsville, N. Y., and Mary A. Drobnyk, Bath, N. Y.

New York Western Union.

A BASKET BALL TEAM composed of Misses Warnken, Loeffler, Vanacore, Volkert and Schmitt, recently won over a team composed of Misses Bissong, Switsavage, McEnerney, Volze and Hennessey. The game was played in the gymnasium of the Hudson Guild.

THE YOUNG WOMEN multiplex operators and supervisors from the offices in Salt Lake City and Chicago, who have been detailed to duty in New York main office during the past few months, have returned to their respective cities. The girls made a very favorable impression in New York.

THE NEWLY FORMED Camera Club held its second meeting on the evening of April 15, in room 1702, 24 Walker St. Officers were elected and plans made for hikes with the films and plates.

J. P. CHOLERY, of the Morse department, has returned to duty after several weeks absence due to illness.

EARLY NIGHT SUPERVISORS on duty in this office held the first of a series of conferences on April 10. Traffic affairs were discussed.

JOHN ROBINSON, age 66 years, a member of the all-night staff in this office for many years previous to five years ago when he retired, died in St. Francis' Hospital on April 13th. Mr. Robinson was unmarried.

Philadelphia Western Union.

ALBERT H. SPRACKLEN, repeater chief, on April 9 celebrated his seventy-fifth birthday, and was presented with an appropriate gift by his associates.

THE ELECTRICAL AID SOCIETY gave its annual entertainment and dance at Mercantile Hall on April 7. A large gathering of telegraph and telephone employees were present. The event was a pronounced success.

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R. L. HEILMAN, switchboard attendant has resigned from the service to take a position with a prominent local electrical house.

MISS LAURA MCGRATH, multiplex supervisor, has returned to duty after a protracted illness.

MR. AND MRS. HOFFMAN recently lost by death their young son, who died suddenly after a brief illness.

ROBERT SHADE, chief clerk to Mr. Webb, is an active and popular worker in the main office. When occasion requires it Mr. Shade sits in on heavy trunk circuits and sets a fast pace.

DANIEL GOOD, traffic chief, is a booster for cooperation. He is quite successful in inspiring others to see the advantage of all working together in the interests of good service.

Pittsburg Western Union.

DAVID LOCKER, Morse operator, has taken a position in the New York main office.,

J. J. FEDIGAN, who operates the Pittsburg end of the fast Boston circuit, was detailed recently to cover the basketball tournament held at Buckhannon, W. Va.

WILLIAM F. BROOKS, late of the American Telephone and Telegraph Company's service, is now employed in the Morse department, Pittsburg.

G. C. SAMMETH, W. P. Kappler and J. R. Gallagher, formerly in Postal service, are now employed in this office in the Morse division.

MRS. ARMOUR has been transferred from the Morse department to instructress of the Morse school.

P F. DRISCOLL, general wire chief, has the sympathy of the staff in the recent death of his sister, Miss Sarah Driscoll.

ROBERT DOYLE, formerly of the testing and regulating department, is expected to return from Siberia in the near future. He was across the Pacific with the expeditionary forces.

RALPH LOHMIRE is supervisor in the Morse department.

H. J. BROWN is editor in chief of the service bulletin *Traffic Smoke,* and has as associate editors the following aids: Automatic department, W. P. Schragen, H. A. Woods, A. W. McGeegan and N. P. Balmuth; Morse department, W. F. Fox, B. W. Jones. A. H. Golden and Philip Serbin; testing and regulating department, O. A. Huber, C. F. Nicklas, John Davis, C. E. Parfitt, F. J. Piverotto and J. J. O'Sullivan; telephone department, Miss M. Bronder, Miss E. Steele and Miss R. Markey.

Lake Division, Western Union.

NEW MANAGERS recently appointed include: F. A. Harris, Princeton, Ind.; Laura Irish, Holland, Mich.; Pearl Witherall, Oxford, Mich., and Mabel Lewis, Wyandotte, Mich.

PEORIA, ILL., employees have a flourishing Local of the Association of Western Union Employees. W. W. Strunk is president, E. W. Frye vice-president, and J. B. Howard secretary-treasurer.

J. J. WELCH, division superintendent of traffic, and J. W. Konigsmark, general wire chief, Chicago, paid an official visit to the Peoria, Ill., office recently.

H. HARTRUNFT, formerly manager of a branch office at Peoria, has been advanced to the position of assistant manager at the main office.

P. A. HENEGAN, formerly wire chief at Peoria, Ill., is now acting as chief operator at Jacksonville, Illinois.

E. W. FRYE has been appointed day wire chief at Peoria, and F. R. Sullivan night chief operator in the same office.

MANY REPORTS are now coming in detailing the experience of Western Union employees stationed at points visited by the disastrous tornado of March 28. In the city of Elgin, Ill., there was but one wire left intact, and over this circuit during the three days following the storm, a very large number of telegrams were handled.

UNDER THE AUSPICES of the Women's League of the Western Union Telegraph Company, Chicago, the musical revue "Oh, Oh, Cindy!" was presented in the Aryan Grotto Temple on April 10.

AT SHELBYVILLE, IND., on April 7, S. B. Morris, who had charge of the first telegraph office opened in the city of Indianapolis, Ind., celebrated his ninetieth birthday. It was on July 26, 1852, that Mr. Morris transferred the office to John F. Wallick, who in later years became superintendent of the Western Union Telegraph Company. In 1877, Mr. Morris started a mercantile business in Shelbyville which at the present time occupies an entire block.

Cincinnati, Ohio, Western Union.

RECENT ARRIVALS include J. M. Ball. Andrew Francis Sharp, and W. R. Howard, all from Detroit, Mich.

ROBERT BAUERMEISTER, recently employed in the St. Louis, Mo., office, is now employed in this office.

R. T. PERRY, recently in Bluefield, W. Va., and G. W. Smith, recently employed in Peru, Ind., have joined the staff here.

J. W. MARTIN, recently employed in Kansas City, Mo., and J. B. Wardell, recently in the service of the Louisville and Nashville Railroad, are recent additions to the force here.

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MESSENGERS using HEAVY SERVICE TRACTION TREAD have a decided advantage over the rest of the force and experience fewer break-downs and delays.

Time, the ever vital factor in deliveries—demands the best of riding equipment.

Explain to your force that HEAVY SERVICE TRACTION TREAD possess greater anti-skid qualities, are more serviceable, and necessitates fewer repairs.

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WILLIAM GREEN, for some time employed in this office has resigned to take up farming.

THE ASSOCIATION OF WESTERN UNION EMPLOYEES, Cincinnati Local, will give a dance in the near future as a financial benefit for the Association's ball club.

JOHN SPANGLE, of this office, is now agent for TELEGRAPH AND TELEPHONE AGE, taking up the work heretofore in charge of W. E. Lukens.

MRS. E. MCCARTNEY, of the Chicago office, is now employed in the multiplex department of this office.

THE OPENING of the baseball season is expected to result in a large increase in telegraph traffic handled from Cincinnati office.

LAWRENCE CANADAY, recently employed in the Cedar Rapids, Iowa, office, is now a member of the multiplex staff here.

MISS A. HOFFMEISTER has returned from Akron, Ohio, and Miss H. Fisher of the multiplex department has resigned to take up home duties.

New York Telegraphers' Aid Society—Auditors' Report for 1919.

STATEMENT FOR THE YEAR ENDING MARCH 6TH, 1920

Balance on hand March 6th, 1919		$23,817.62
Receipts		
From Dues	$4,249.60	
" Initiation Fees	69.00	
" Interest	1,091.20	5,409.80
Total,		$29,227.42
Disbursemets		
Sick Benefits	$3,459.00	
Death "	1,900.00	
Expenses	811.36	$ 6,170.36
Balance on hand March 6th, 1920		23.057.06
Total,		$29,227.42

RELIEF FUND

Balance on hand March 6th, 1919	$6.542.65
Receipts	866.36
Total	$7,409.01
Disbursements	$ 377.00
Balance on hand March 6th, 1920	7,032.01
Total,	$7,409.01

BALANCES		ASSETS	
Aid Society	$23,057,06	Mortgage	$ 7,500.00
Relief Fund	7,032.01	Bonds	12,974.92
		On Deposit	9,614.15
Total,	$30,089.07	Total,	$30,089.07

F. J. NURNBERG,
J. F. E. HOPKINS,
H. M. HEFFNER,
Auditors.

POSTAL TELEGRAPH-CABLE COMPANY.

EDWARD REYNOLDS, vice-president and general manager, accompanied by John J. Whalen, traffic manager, is now on the Pacific coast in connection with expansion of facilities in that territory.

C. L. BENNETT of the plant department, Chicago, has been appointed cable supervisor, Western Division, with headquarters at Chicago.

E. P. PHILLIPS has been appointed plant supervisor of the Western Division, with headquarters at Chicago.

MANAGERS APPOINTED: G. H. Frame, St. Joseph, Mo.; L. E. Widiger, Abilene, Kan.; W. B. Lyon, Tulsa, Okla.; Wesley A. Young, Oneida, N. Y.; H. L. Stuckey, Kendallville, Ind.; Walter Emert, Michigan City, Ind.; C. E. Richardson, Barstow, Calif.; A. E. Montville, Lake Placid, N. Y.; M. D. Simpson, Goshen, Ind.; S. B. Friedman, Mishawaka, Ind.; Alice Haynor, Ionia, Mich.; Clara Thompson, Cartersville, Ga.; and L. O. Bowyer, Bartow, Fla.

New York City Postal.

FRANK ENRIGHT, formerly of the Thirty-seventh Street office, has been appointed manager of the Twenty-third Street office.

WILLIAM PAUL, formerly chief operator of the Franklin Street office, has been transferred in the same capacity to the sugar district office on Wall Street.

MISS BROOKS has been appointed in charge of the office in the Imperial Hotel.

JOHN BARRY has been transferred from a clerical position at the Leonard Street office to the position of operator at the Fifty-first Street office.

A. SILLMAN, formerly assistant city chief operator, died recently after a long illness. The entire operating department force of the main office was grieved to hear of his passing away.

IN THE NEW YORK MAIN OPERATING ROOM the following members of the staff are now absent on vacations: Misses R. Siegel, E. Seifert, A. Eylward, M. Sovetts, Mae Casey, Gladys Shirley, K. Smith and M. A. Browne.

Philadelphia, Pa., Postal.

D. H. GAGE, division engineer, New York, and K. F. Stiles, superintendent at Charlotte, N. C., were recent Philadelphia official visitors.

F. A. GRASTY, for many years manager of an important branch office in Baltimore, Md., is now in charge of the branch office at No. 54 Market Street, Philadelphia.

MRS. EMILY HOFFMAN is manager of the recently refitted branch office at North and Pleasant Streets.

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L. J. HEISMAN is now manager of the office at Camden, N. J.

A. T. JORDAN, in charge nights at Wilmington, Del., is recovering from a severe attack of pneumonia.

Worcester, Mass., Postal.

E. KIMMEY, superintendent of the fourth district, Eastern Division, was a Worcester official visitor recently.

D. H. GAGE, division engineer, New York, has completed the installation of additional motor-generators and duplex equipment in this office.

WILLIAM MERRILL, of the construction department, has completed the work of stringing additional wires to branch offices in Worcester.

J. SNIDER, of the Boston office, who has been assisting with the work at Worcester, returns to Boston on May 1.

Boston, Mass., Postal.

RALPH KELLER, manager of the City Hall Avenue, Boston, branch office, during the month of March acted as manager at Portland, Maine.

T. J. MAHONEY, operator, who was "loaned" to the Government during the war period has returned to the service and has been appointed manager, relieving at branch offices.

MISS EUGENE HENDERSON, branch manager in the wool district, and who has been away from duty on account of illness, is now recovering and expects soon to return to work.

J. F. SWEENEY, during the war in military service, has reentered the service of this company and has been assigned as manager of a branch office.

MISS G. M. HOYT recently resigned from the service to enter the employ of the American Express Company.

WILLIAM MCLAUGHLIN is relieving Harry Murphy in charge of the concentration switchboard. Mr. Murphy is away on account of illness.

Albany, N. Y., Postal.

E. T. FLANAGAN, for several years manager of the company's office at Lake Placid, N. Y., has been transferred to the staff of City Manager J. J. McDermott, New York.

ALBERT E. MONTVILLE, chief operator at Plattsburg, N. Y., has been appointed manager at Lake Placid, N. Y. Charles Gendron has been appointed chief operator at Plattsburg.

FRANK HAYWARD has been transferred from Amsterdam, N. Y., to the main operating room, Albany, N. Y.

W. C. ROSELL, operator at the General Electric Company's office, Schenectady, N. Y., has been transferred to Jersey City, N. J.

E. J. HUDSON, operator at Schenectady, has passed a civil service examination and has gone to Washington, D. C., to accept employment in Government service.

Chicago Postal.

EDWARD REYNOLDS, vice-president and general manager, New York, was a recent visitor in Chicago on his way to the Pacific coast. Mr. Reynolds was accompanied by J. J. Whalen, traffic manager, New York.

JOHN F. SKIRROW, chief engineer, New York, was an official visitor in Chicago recently.

CHARLES M. BAKER, general superintendent of plant, Western Division, has returned from Omaha, Neb., and other Western points, where he has been in connection with the restoration of lines damaged in recent storms.

F. J. KERNAN, auditor, New York, was a Chicago official visitor for several days during the first week in April.

EDGAR W. COLLINS, general superintendent, Chicago, has started on a trip of inspection to offices in North American Telegraph Company territory in Minnesota and Iowa.

L. R. THOMAS, superintendent of the sixth district, Western Division, and Jed G. Blake, superintendent of the first district, made inspection trips to offices in their respective districts during the first week in April.

W. L. SIMPSON, division engineer, Western Division, has returned from Cleveland, Ohio, where in consultation with General Superintendent E. W. Collins, and Assistant General Manager C. A. Comstock, plans were made for moving the main office, commercial department.

JOHN F. LOONEY, superintendent at Indianapolis, Ind., was a business visitor at Division headquarters, Chicago, recently.

R. H. AHLER, assistant quad chief, Chicago main office, has gone to Reno, Nevada, where he will take over the managership of that office.

H. W. SPANGENBERG, expert Morse operator, who for some time has worked the Chicago-Seattle fast duplex, has been appointed chief operator of the repeater office, Butte, Mont.

Death of H. H. Dengler.

H. H. DENGLER, assistant chief operator, main office, Postal Telegraph-Cable Company, Chicago, Ill., died in that city on April 18.

Mr. Dengler was one of the most widely known

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legraph chiefs in the country. During the past renty-five years he has been employed in the nicago office of the Postal company, most of this ne as quadruplex chief, wire chief and assistant ief operator. During his term in the Chicago fice Mr. Dengler saw the company's traffic grow om a small volume to its present large figures. id he was intimately identified with the improve- ents and extensions made from time to time to ke care of the growing business.

He will be greatly missed by his office associates id by the officers of the company.

Seattle, Wash., Postal.

W. D. RICE has been appointed night chief ope- ator of the Butte, Mont., office.

B. W. FIELDS, division engineer, San Francisco, t the present time is engaged supervising the in- tallation of new equipment in the Portland, Ore., ffice. The operating department is being moved to ne fourth floor.

MANAGER TRYON, of Olympia, Wash., assisted y George Evans of the Seattle office covered the pecial session of the Washington legislature.

N. B. MAYO has been appointed district lineman t Easton, Wash. Mr. Mayo is a speedy snowshoe raveller as well as a good telegraph operator.

CLYDE DUNLAP, for several years in the construc- ion department has been appointed district line- an at Portland, Ore.

ncrease in Wire Facilities and Staff of the Associated Press.

Increasing its leased wire mileage by twenty-five er cent. or more than 13,800 miles, indicates the remendous spurt taken in the way of expansion by he Associated Press in 1919. On January 1, 919, there were in operation 51,000 miles of wire while today it is over 64,800 miles. To operate hese increased facilities it was necessary to add ifty-three operators so that today there are on the ayrolls of The Associated Press more than 750 xpert telegraphers and in addition, almost 100 au- omatic telegraph printing machines are delivering he report in various cities.

How well this network of wires covers the coun- ry can readily be seen from the fact that the last ensus shows 115 cities in the country with a popu- ation of 50,000 or more and in every one of them s located an Associated Press leased wire and a elegraph operator or an automatic machine.

Western Union Annual Meeting—Directors Re-elected.

At the annual meeting of the stockholders of the Western Union Telegraph Co. on April 14 the re- iring directors were reelected. Subsequently the oard of directors met and reelected the executive committee and officers.

The Western Union Telegraph Co. reports for the three months ended March 31, last. (Month of March estimated): Gross revenues, including dividends and interest $28,650,000; maintenance; repairs and reserved for depreciation $3,975,000; other operating expenses, including rent of leased lines and taxes $20,792,000; total expenses $24,767,000; balance $3,883,000; deduct interest on bonded debt $333,000; net income $3,550,000.

Note: Operations for 1919 quarter not stated for comparison; company under Federal control in 1919 and corporate income derived from compensation for use of land line system, income from Atlantic cable system, and dividends and interest.

"Mathematics for Engineers."

"Mathematics for Engineers" is the title of a work by W. N. Rose, which embraces all of the mathematics needed by engineers in practice and by students in all branches of engineering science. The work is in two volumes; the first carrying the studies through algebra, plane trigonometry, mensuration and graphs, the work being carefully graded from an elementary to an advanced stage. The second volume is devoted to the calculus and its applications, harmonics and vector analysis, spherical trigonometry, etc. Volume I contains 507 pages and is an excellent book for the telegraph and telephone engineer or student to possess, as the treatment of the subject of mathematics here worked out is from the engineer's standpoint.

The price of each volume is $6.00 and copies may be procured from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Cable Codes.

TELEGRAPH AND TELEPHONE AGE is headquarters for all cable cipher codes. Telegraph managers would do well to bear this fact in mind when customers make inquiries regarding such codes. We are prepared to furnish full information on the subject, our knowledge being based on over thirty-five years' experience in handling the hundreds of codes on the market. Address TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Coming!!

In early issues of the Telegraph and Telephone Age—an illustrated account of the new automatic telephone system to be used in New York. Also, an illustrated story describing the Tropical Radio Company's Stations in the Southern Seas.

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OBITUARY.

Death of John S. Craig.

John S. Craig, seventy years of age, superintendent of fire alarm telegraphs, Toronto, Ontario, died in that city on March 17. Mr. Craig had been connected with the fire department of Toronto in an official capacity since the year 1892, and was a prominent figure at all gatherings and conventions of fire alarm telegraph superintendents in the United States as well as in Canada. He stood high in his profession and was regarded as an authority in all matters pertaining to police and fire signals.

Telegraph and Telephone Life Insurance Association.

Assessment numbers 674-675 have been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of:—

George Dyer at Indianapolis, Indiana; Joseph Pratt at Riviere du Loup, Quebec; Robert Bauer, Brookville, Pa.; John R. Rose at Cedar Rapids, Iowa; Charles W. Gribble at Houston, Texas; John M. Hudspeth, at Charlotte, N. C.; William Walker at Buffalo, N. Y.; Joseph I. McGrath at Rockaway Park, N. Y.; Charles P. Metzroth at New York; Stephen B. Mills, at San Francisco, Calif.; Daniel Hardy at McDonald, Pa.; Ralph A. Lyon at Brooklyn, N. Y.

On account of the large number of deaths the Association has been compelled to levy three double assessments in succession since January 1st.

CHARLES F. WITTER, sixty-one years of age, for many years employed in the Syracuse, N. Y., office of the Postal Telegraph-Cable Company, died in that city on April 14.

S. B. MILLS, age 45 years, formerly chief operator of the Western Union Telegraph Company, San Francisco, California, died of tuberculosis on March 26.

R. A. LYON, aged 46 years, for some years past identified with the Associated Press, New York, died of pneumonia on March 21st. Mr. Lyon was president of the Four Minute Speakers Association, in Brooklyn, and was prominent in telegraph and newspaper circles.

JAMES CLENDENIN, aged 68 years, an old time Canadian telegrapher, died at Toronto, Ont., March 20.

J. B. SHIELDS, age 49 years, identified with the telegraph bureau of the New York World, died of pneumonia on April 10th.

Orders Received By Wireless.

J. H. Bunnell and Company, No. 32 Park Place, New York, dealers in telegraph and radio amateur supplies, have obtained a Government license to maintain a radio telegraph station. The call is 2ALF. An experienced radio operator is on duty from 9 to 10 a. m., and from 4 to 5 p. m., daily during which periods orders are received from radio amateurs for supplies, and acknowledgements given.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

BY ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

From TELEGRAPH AND TELEPHONE AGE,
253 Broadway, New York.

Book on Alternating Currents.

Arithmetic of Alternating Currents, is the name of a new book by E. H. Crapper. For those who are familiar with elementary mathematics, this book will be found valuable as it describes in a thorough manner periodic and alternating currents; generation of alternating electromotive forces; inductances; inductive circuits; capacity and condensers; resistance, inductance and capacity in parallel; static transformers; induction motors and transformation of currents.

The book contains 208 pages. Price $1.25. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Electrical Instrument Making for Amateurs.

The above is the title of a book by S. R. Bottone, now in its eighth edition, which was written for the amateur experimenter who desires to learn electrical engineering principles by making electrical devices with his own hands. There are 272 pages and ninety-six illustrations, and detailed descriptions are given of how to make condensers, Leyden jars, induction coils, electroscopes, Tesla coils, magneto armatures, thermopiles, elementary wireless telegraph apparatus and many other pieces of electrical apparatus. The instructions are so simple that only inexpensive tools are required in making the instruments described.

The book sells for $1.35, and copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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ACK NUMBERS of this journal three or more months old will be charged for at the rate of 25 cents per copy.

No. 10. NEW YORK, MAY 16, 1920. Thirty-eighth Year

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A Neglected Branch of Study.

At conferences and conventions of telegraph and elephone officials the observer who sits through he various sessions continually has his attention rawn to the lack of facility in extemporaneous rgument, altogether too common among men who ave accomplished creditable results along other ines.

It is a common experience at almost any con-ention to see the floor monopolized by perhaps not nore than ten per cent. of those in attendance. This is not to be regarded as a reflection upon the ien who do the talking. On the contrary, the fact hat they have by practice acquired the ability orally o express their views, is very much to their credit, nd it is plain history that those who enter ener-etically into discussions of the subjects under con-ideration as a rule make greater progress profes-ionally than the men who for one reason or an-ther are never heard to express opinions.

Sometimes the fellow who is tongue-tied while ie discussion is officially under way, displays sur-rising loquacity after the meeting has broken up, id he is able to foregather in a corner with a small umber of the delegates who also have been qui-cent.

To the man who aspires to become a successful telegraph or telephone official there are many personal accomplishments which, when mastered, smooth out the paths along the way. Among these might be enumerated a knowledge of advanced mathematics, a knowledge of historical technical development, the ability to write forceful and logical letters, a knowledge of the law of corporations, of economics, of electrical engineering—and the ability to speak pleasingly and convincingly in public.

Of these various factors of success there is not one which is more important or more creditable than that of facility of oral expression, and in the list there is not an accomplishment which may be acquired at less expense and with less inconvenience than this.

There is one consideration alone which should prompt every intelligent and earnest official to practice public speaking. It is that frequently those who from boyhood have possessed the "gift" of clear and rapid oral expression are found occupying the rostrum and holding the attention of a large gathering of men when, in fact, the knowledge they possess of the subject in hand is but superficial—much less thorough than that possessed by perhaps a dozen of those present who, through diffidence, refrain from getting upon their feet.

Most men belong to at least one faternal lodge or society, and the regular meetings of organizations of this sort offer many opportunities for practice in extempore speaking and in overcoming false modesty.

The best elementary practice in speaking is reading aloud from standard magazine articles or books, and this may be done where there is no one else present to see or to hear. A few weeks of reading aloud will bring new powers of expression and make a man acquainted with his own voice. When this stage has been reached the ambitious man should avail of every opportunity presented to publicly express his views, keeping in mind that his speech must be pleasing and convincing.

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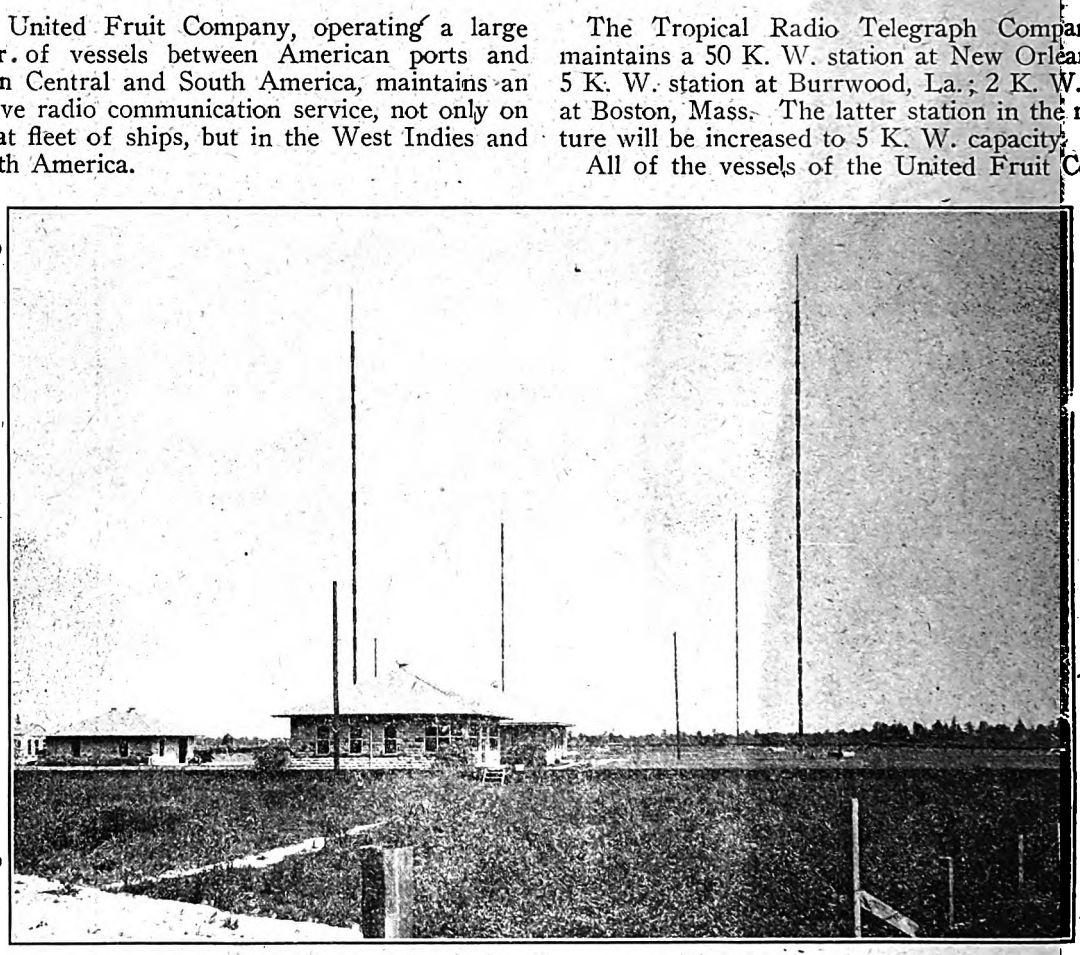
TROPICAL RADIO TELEGRAPH COMPANY

STATIONS AND EQUIPMENT

The United Fruit Company, operating a large number of vessels between American ports and ports in Central and South America, maintains an extensive radio communication service, not only on its great fleet of ships, but in the West Indies and in South America.

The Tropical Radio Telegraph Company als maintains a 50 K. W. station at New Orleans, La 5 K. W. station at Burrwood, La.; 2 K. W. statio at Boston, Mass. The latter station in the near fu ture will be increased to 5 K. W. capacity.

All of the vessels of the United Fruit Compan



NEW ORLEANS, LA., STATION OF THE TROPICAL RADIO TELEGRAPH COMPANY.

The operation of the radio stations is in the hands of the Tropical Radio Telegraph Company, a subsidiary of the United Fruit Company, and of the total number of vessels owned by the United Fruit Company the Tropical Radio operates on twenty-eight vessels.

The long distance stations operated are:

Swan Island, Caribbean sea, 50 K. W.
Santa Marta, Colombia, 50 K. W.
Limon, Costa Rica, 5 K. W.
Bocas del Toro, Panama, 3 K. W.
Bluefields, Nicaragua, 3 K. W.
Tela, Honduras, 5 K. W.
Truxillo, Honduras, 2 K. W.

The Tela and Truxillo stations are owned and operated by the Tela Railroad Company, and Truxillo Railroad Company, respectively, but are communicated with through the United Fruit Company's radio system.

are equipped with radio apparatus and at all times are in communication with one or more of the stations on land.

The radio apparatus used on these vessels and at the stations named is that of the Wireless Specialty Apparatus Company of Boston, Mass., of which Mr. George S. Davis is president and general manager.

This manufacturing company has been in existence since the year 1906 and controls the patents of the well known radio scientist, Greenleaf W Pickard, the inventor of many of the best forms of crystal detectors widely used in radio signaling.

The illustrations presented herewith show station and boat equipment manufactured by the Wireless Specialty Apparatus Company and in use on United Fruit Company vessels and at shore stations.

Fig. 1 shows the aerial masts and station buildings of the Tropical Radio Telegraph Company at New Orleans, La.

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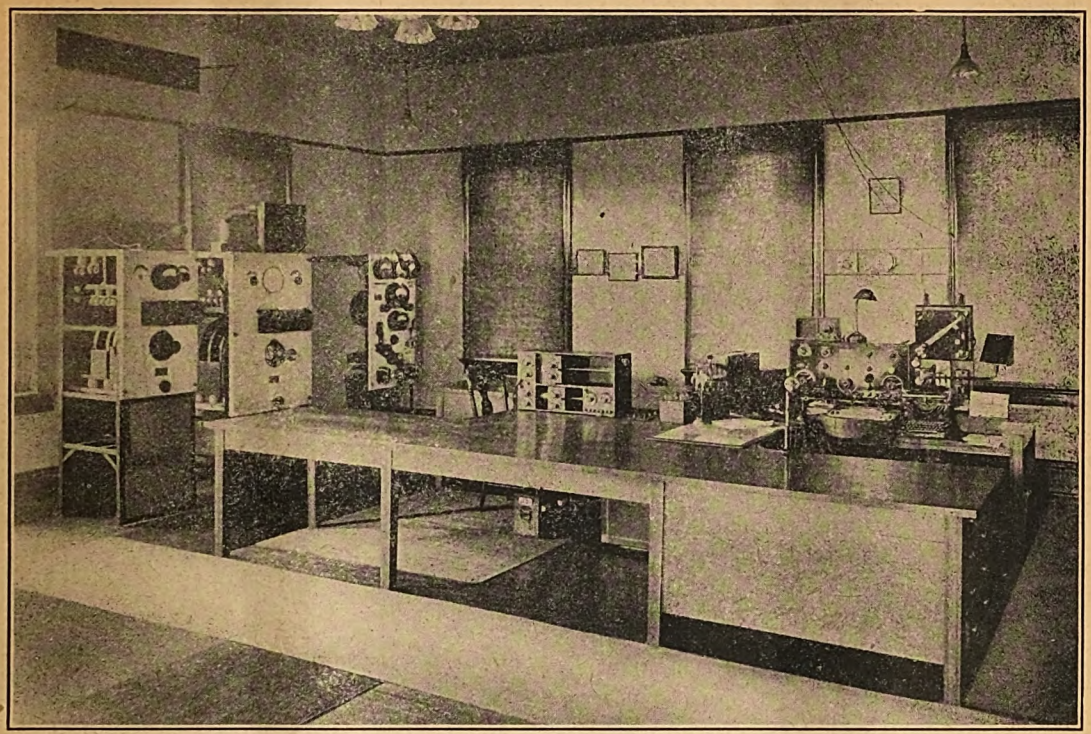

FIG. 2.

OPERATING ROOM OF THE NEW ORLEANS STATION OF THE TROPICAL RADIO TELEGRAPH COMPANY, EQUIPPED WITH WIRELESS SPECIALTY AUXILIARY TRANSMITTER AND RECEIVER.

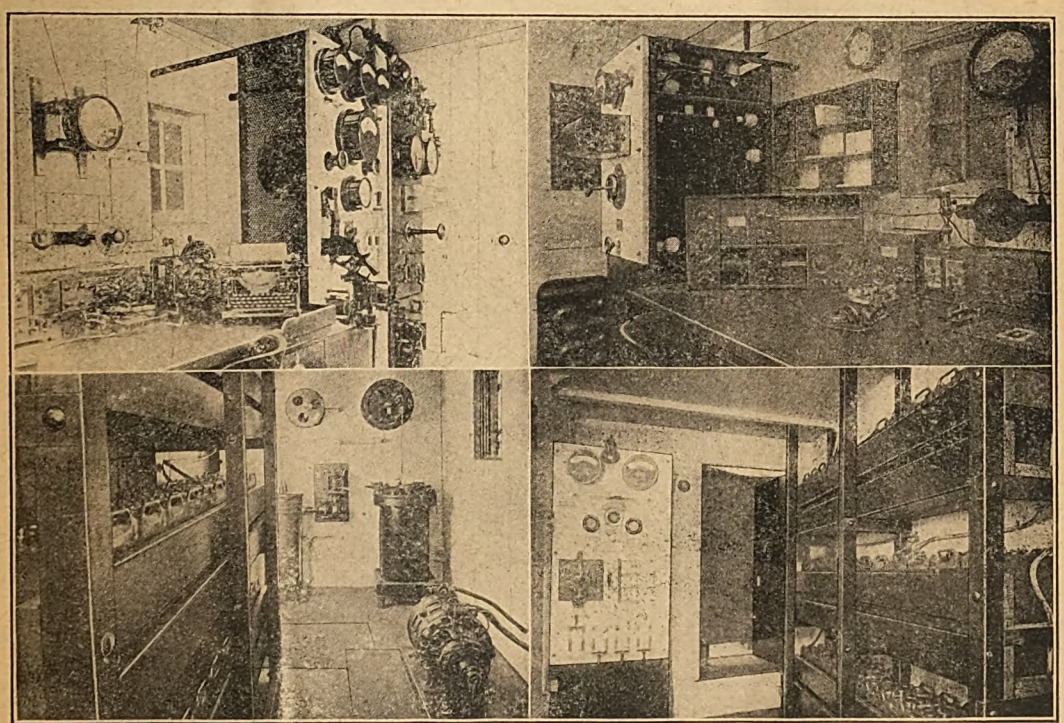

FIG. 3.

FOUR VIEWS OF RADIO INSTALLATION ON THE UNITED FRUIT COMPANY'S STEAMSHIP PASTORES. WIRELESS SPECIALTY APPARATUS. IN OPERATION SINCE 1913.

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FIG. 4.

WIRELESS SPECIALTY APPARATUS INSTALLATION ON THE UNITED FRUIT COMPANY'S STEAMSHIP TURRIALBA.

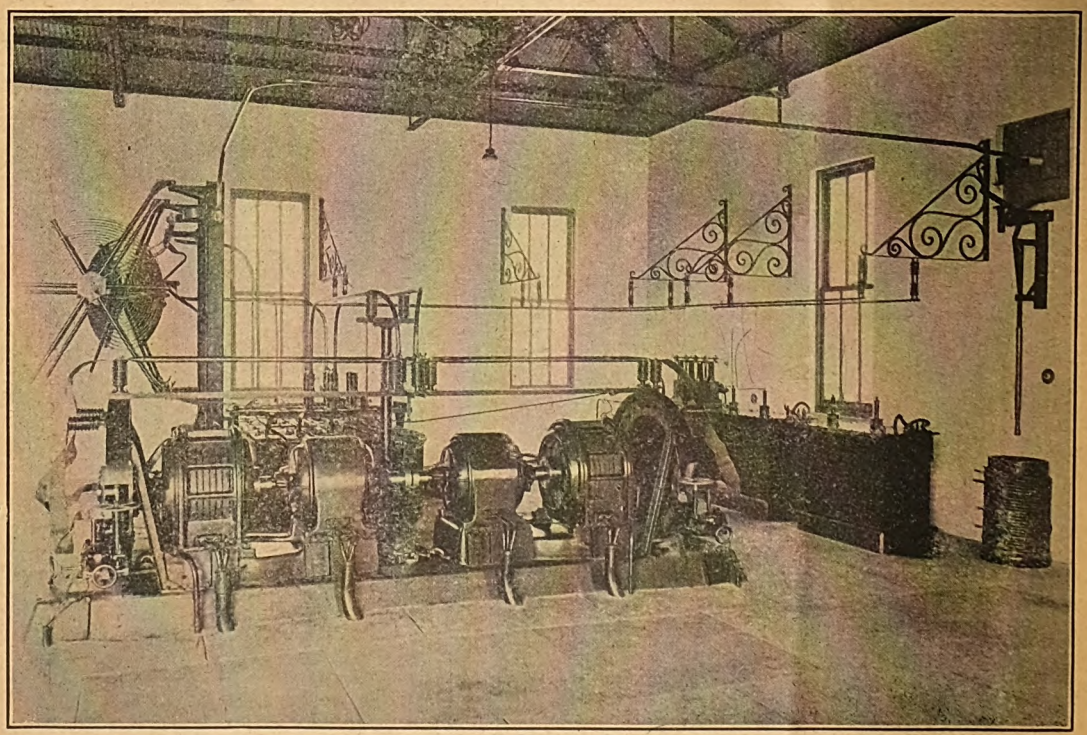

FIG. 5.

POWER PLANT AT NEW ORLEANS STATION OF THE TROPICAL RADIO TELEGRAPH COMPANY, SHOWING A 50 KILOWATT TRANSMITTER.

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Fig. 2 shows the interior of the operating room of the same station. The power and control panels are shown on the left, while the receiving equipment is shown in the right and left background.

Fig. 3 shows four views of the sending and receiving equipment installed on the steamship *Pastores*, which is a typical ship installation.

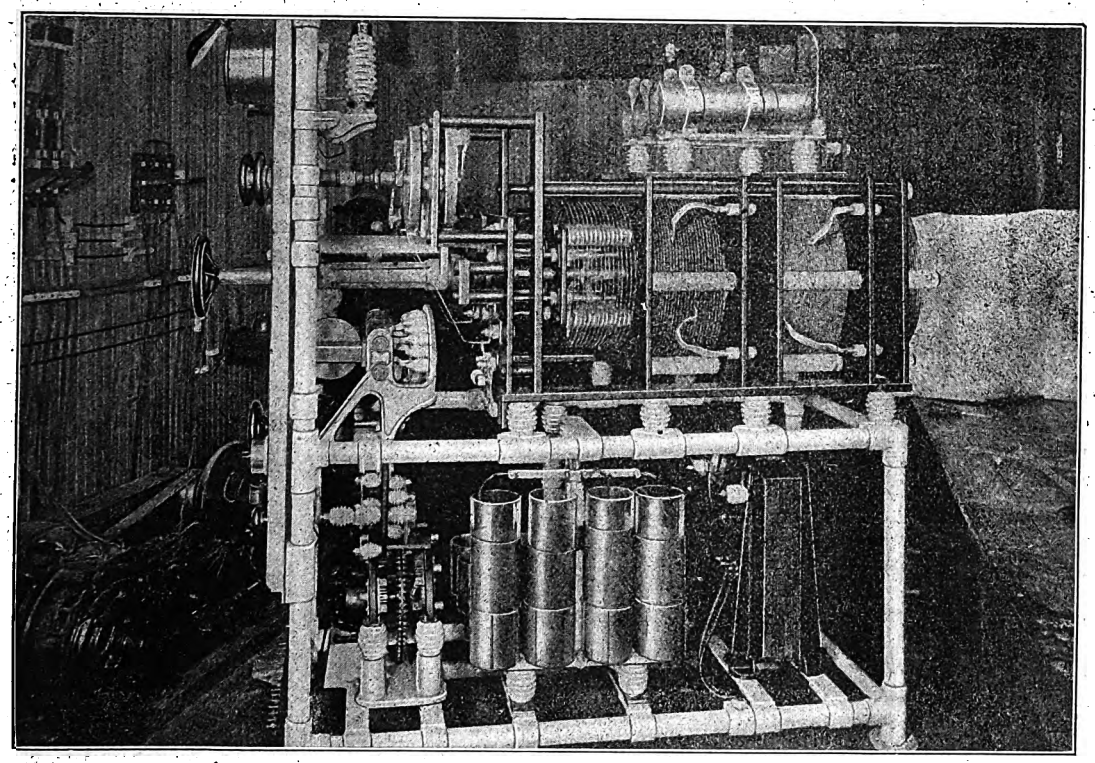
Fig. 4 shows the interior of the radio operators cabin on the steamship *Turrialba*. The operator is shown sitting in front of a typewriter used in copying radiograms. At his back is the power control panel, and on the desk is mounted the receiving instruments.

Fig. 5 is a photographic reproduction of the power plant at the New Orleans, La., station. This is a 50 K. W. installation.

Fig. 6 shows the 5 K. W. installation at the Swan Island station.

In addition to being president of the Wireless Specialty Apparatus Company, Mr. George S. Davis is general manager of the radio telegraph department of the United Fruit Company; Mr. C. L. Pitcher is assistant general manager, with offices at New York.

Mr. H. O. Easton is superintendent at New Orleans, La., of the United Fruit Company's tropical radio stations, and the following are the chief operators in charge at the various stations: Swan Island, George H. Rogers; Santa Marto, Evan F. Bourne; Limon, Roy G. Mackenzie; Bocas del Toro, Kenneth H. Fee; Bluefields, William F. Dillon; Tela, James A. McGregor; Truxillo, George F. Duvall; New Orleans, E. L. Commagere; Burrwood, Elmer D. Prey; Boston, E. B. Rennard. At the New Orleans station, William E. Beakes is chief engineer.



5 KILOWATT TRANSMITTER INSTALLED IN THE UNITED FRUIT COMPANY'S RADIO STATION ON SWAN ISLAND, CARIBBEAN SEA. WIRELESS SPECIALTY APPARATUS COMPANY'S EQUIPMENT.

Beginning in the June 1 issue of Telegraph and Telephone Age we shall have a series of interesting articles on Submarine Telegraphy.

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MACHINE SWITCHING

WESTERN ELECTRIC COMPANY'S PART IN DEVELOPING APPARATUS FOR AUTOMATIC TELEPHONY

By E. B. Craft, Assistant Chief Engineer.

IN its elements a mechanical switchboard is nothing more or less than a combination of apparatus in which a mechanically propelled cord associates itself with the terminals of your line when you remove the receiver from the hook, and then under the control of the electrical impulses sent out by your calling dial, automatically associates the other end of this connecting cord with the terminals of the line with which you wish to connect. In other words, we substitute a machine for the operator, who now picks up a cord and inserts one plug in the jack of your telephone line, and upon learning the number required, plugs the other end of the cord into the jack of the line you are calling.

The above is a fair picture of what takes place in the small town where there is one exchange. When we come to the larger places, however, where there are a number of central offices, the chances are that the majority of calls will be for subscribers connected to exchanges other than your own. It then becomes necessary for this mechanical switchboard, and the manual as well, to perform an intermediate operation which consists of selecting a trunk line leading to the exchange in which your wanted subscriber is located. The difference here is that your mechanical operator, instead of connecting you direct with your subscriber, picks out an idle trunk to the exchange wanted, and another mechanical operator at that point picks up your connection and through its mechanical connecting cord associates it with the line you want. It is evident that this same process could be continued on through other exchanges or in the first step of the operation by selecting the proper group of trunks, connect you with any one in a given area, no matter how many switching centers there were.

Fundamentally this is all there is to it, but, of course, we have left out of consideration all the various auxiliary operations, such as the test for busy trunks, testing for busy line, ringing the subscriber's bell, operating the central office message register, and many other functions that are performed in the ordinary course of establishing a complete connection. In order, however, to avoid a brainstorm, we must take all these things for granted, as having been accomplished in the mechanical system with substantially the same result as in the old manual system.

The items of new apparatus that go to make up the system will now be briefly described.

Sub-Station Dial.

This dial, which is illustrated in Fig. 1, located at the subscriber's station. In the case a desk stand, it is mounted on the base, and in th case of a wall set, on the face of the set itself. is so designed that by manipulating a finger whe electrical impulses are sent out over your line, co responding with the numerals or letters appearin in the holes. When used in the larger cities, th dial will bear certain letters of the alphabet in add tion to the numerals, and in the smaller center numerals only may be employed. In making a ca the subscriber will, of course, refer to the telephon directory, and he will find in the new directory tha

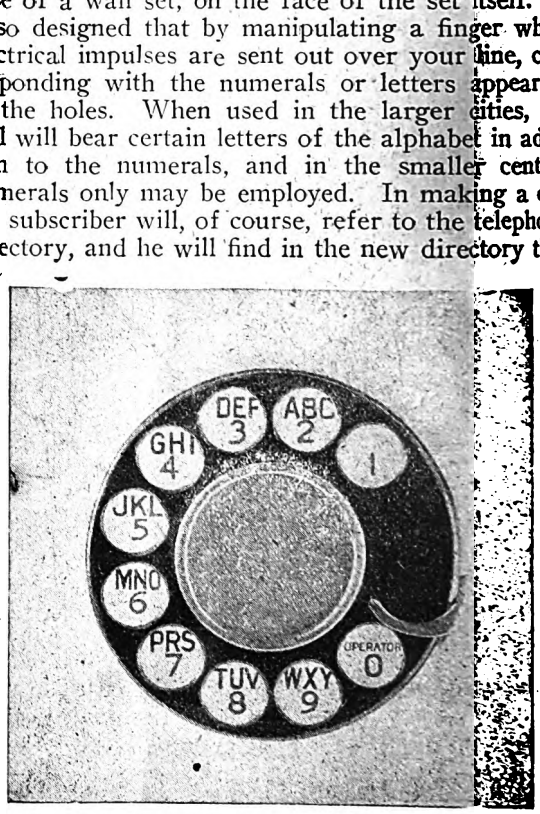

Fig. 1. Subscriber's Calling Dial.

the central office name is printed somewhat differ ently from heretofore. These conform to the pres ent manual listings, except that the first three letter of the office name are set out prominently. Simpl as this change in the form of listing appears, unti it was developed by the Bell system experts, no satisfactory system of designating telephone num bers for machine switching systems for large cities such as New York, Chicago, Boston and Philade phia, was known.

One advantage of this plan is that it does no necessitate the abandonment of all the existin manual designations. For manual operation

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leaves them substantially as at present. For machine switching operation, the same form of listing is used in the directory, a clear indication being given as to the portion of the listing which should be dialed in making an automatic call.

Under this plan machine switching calls are passed to the central office mechanism by dialing the first three letters of the office name and the four numerals followed by the party line designation, if any.

In medium size multi-office cities where six-digit calling is practicable, only the first two letters of the office name will be given prominence in the directory. In very small multi-office cities where

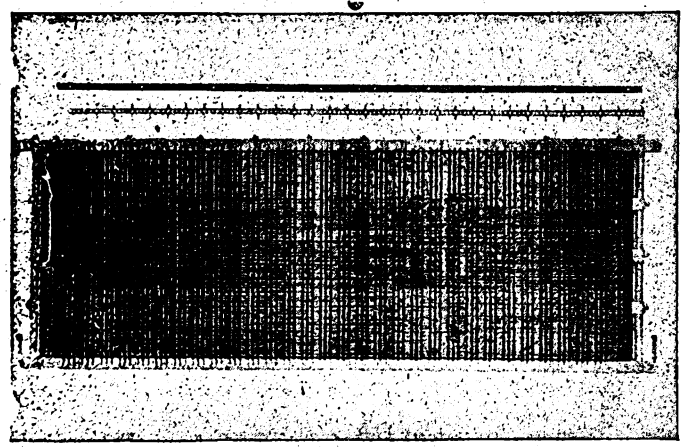

FIG. 2. MULTIPLE BANK SHOWING INDIVIDUAL INSULATING AND TERMINAL STRIPS.

only five digits are required, the telephone number may consist of five numerals and no letters may appear on the dial.

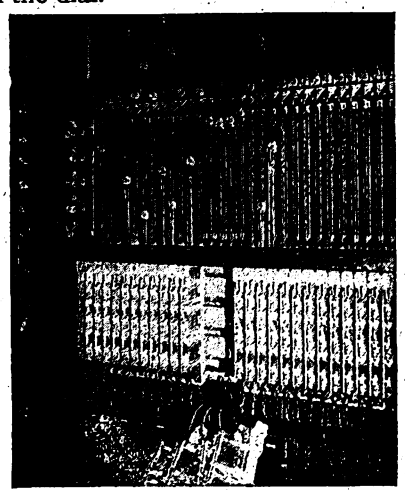

FIG. 3. TYPICAL SELECTOR FRAME SHOWING CONSTANTLY REVOLVING FRICTION ROLLS, MAGNETIC CLUTCHES AND BRUSH LIFT RODS.

SELECTOR FRAME.

This mechanism, which is used to perform the various automatic switching functions within the office, consists of a so-called "bank," made up of a large number of horizontal brass strips, insulated from each other and piled up so that there may be as many as 300 in one panel, which will comprise the terminals for 100 lines or trunks. These strips have projecting lugs on each side to provide contact members, over which vertically operated brushes or elevators ride. A close view of one of these panels is shown in Fig. 2.

Arranged in front of this panel or as in practice, a group of five panels serving 500 lines, or trunks, are vertical lift rods having triple contact brushes, which ride over the projecting lugs of the panel. These lift rods can be moved up or down at will and are under definite control by means of the continually moving friction rolls at the base of the frame. Each lift rod has associated with it a system of electromagnets which, when operated to force the flat metallic strip which forms the end of the lift rod against the rolls, will move the rod at slow speed or high speed or will return it to its normal position, depending upon the magnet that is energized. Fig. 3 shows a section of a frame with the brushes in various positions. It also shows some of the electro-magnetic clutches removed, exposing the friction drive rolls. Fig. 4 shows a completely assembled selector frame arranged for 500 lines, or trunks, with 30 elevators or brush rods on each side. At the top of the frame is a commutator or impulse making device which has associated with it a brush permanently attached to the lift rod. This is for the purpose of sending out electrical impulses as the brushes pass over the terminals of the bank, and in connection with the "sender," which will be described later, controls the movement of the selecting mechanisms. Fig. 5 shows the commutator and its brush more in detail.

At the right-hand side of the selector frame will be noted a row of mechanisms which are known as sequence switches, and one of these is shown in Fig. 6. This is a power driven contact making device somewhat on the order of an electric sign flasher, and is used to perform certain circuit switching functions incidental to the operation of the selecting mechanisms. One of these switches takes the place of a large number of ordinary relays, and performs the work very much more cheaply and accurately. By simply changing the shape of the mental segments on the cams, one of which is shown at the right of Fig. 6, any desired combination of opening and closing of circuits may be set up as the shaft revolves.

SENDER.

It will be noted that the dial is arranged with ten holes, and a complete revolution of the finger wheel will send out ten impulses, and successive operations of the dial will send out successive groups of impulses ranging from one to ten. In other words, these impulses are sent out on a decimal basis. You will recall that the panels of the selector frames are arranged in banks of 500. These large groups are desirable because it makes possible a more economical use of trunks between offices and also reduces the cost of the apparatus because of the larger number of trunks a single lifting mechanism may serve.

In order, therefore, that the decimal impulses sent

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out by the calling dial may properly select a terminal in the non-decimal group making up the panel, we employ a so-called "sender," which is a contrivance arranged to receive and store the impulses as they are sent in from the calling device. It then controls the elevators or selectors in their upward motion toward the terminals of the trunk group or line wanted, in such a way as to cause them to arrive at the proper point no matter where the terminals may be located in the selector banks.

When the elevators are started upward, the "senders" permit them to go to the desired point and stop them by removing their driving power. This is accomplished through the commutators located at the top of the selector frames, which, as the elevators move, transmit back to the "sender" the number of impulses which the "sender" has been set to receive, by the manipulation of the calling device at the subscriber's station. This method of operation is known as the "reverse impulse control" and is an outstanding feature of this machine switching system, and is distinguished from systems wherein the selecting mechanisms are operated

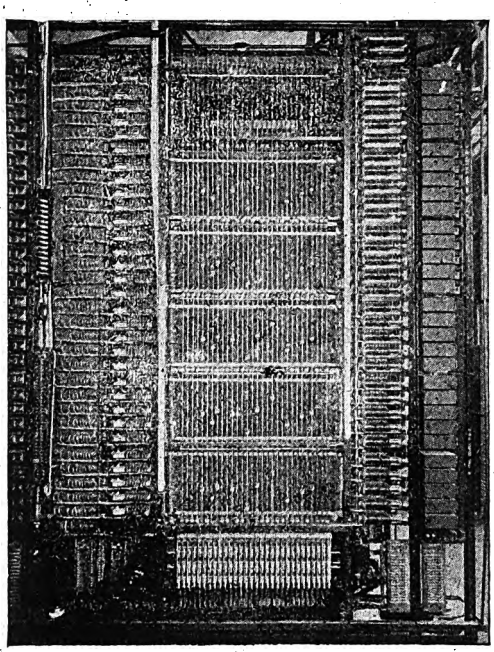

FIG. 4. TYPICAL SELECTOR FRAME SHOWING COMPLETE ASSEMBLY WITH AUXILIARY APPARATUS.

directly by impulses of current, the duration, character and speed of which are controlled solely by the calling device at the subscriber's station. The use of the "sender" is also a new feature in the mechanical switching system, and with the "reverse impulse system of control" possesses many advantages, some of which have been touched upon and others will be described later.

Fig. 7 shows a sender frame, which is nothing more than an aggregation of sequence switches, relays and small twenty-two-point selecting switches all wired together in a manner which our editors would say no human being should be called upon to understand.

Now that we have a picture of what the apparatus looks like, let us see how it functions in its business of connecting one telephone subscriber with another. Figure 8 shows a schematic drawing of three central offices with the apparatus units so arranged as to show a connection set up from one to another. The terms "line finder," "district," "office," "incoming" and "final" applied to the frames are simply designations of the uses of the selector frames previously described in detail. Mechanically they are similar and serve to associate connecting brushes with any one of a group of line or trunk terminals. The subscriber's line terminates in a set of multiple bank contacts in the line finder frame, which contacts correspond to the answering jacks in a manual office. When the re-

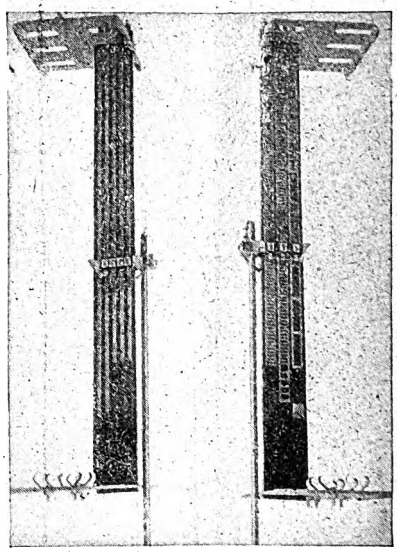

FIG. 5. COMMUTATOR FOR CONTROLLING VERTICAL MOVEMENT OF SELECTING MECHANISM

ceiver is lifted from the switchhook preparatory to dialing, the terminals of the line are selected by a brush of one of the vertically moving lift rods in the line finder frame, and connected automatically to an idle "sender" by means of a small selecting mechanism. Upon completion of these operations, which take but a fraction of a second, a tone is sent out to the calling subscriber indicating that the connection is established to the point where he may commence dialing the number. When the subscriber operates his dial, the electrical impulses (on a decimal basis) are transmitted to the "sender," which receives and registers them, and in turn translates them to the proper basis for the control of the apparatus which is not operated on the decimal system, and then controls this selection through the apparatus, as referred to below.

As shown in the diagram the calling subscriber is in the GARfield office. When this subscriber starts to dial, the "sender" automatically causes the particular district selector, which is permanently

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associated with the line finder originally used, to start and select a trunk leading to the office desired, namely, PENnsylvania. This may be done either directly or through an office selector, in case the number of trunk groups is too large to be placed on the district selector. Assuming that the PENnsylvania office is on an automatic basis, the trunk chosen will terminate at an "incoming selector" frame and the "sender" above referred to will cause the call to be routed through the "incoming selector" to a "final selector" and thence to the particular line desired. When the connection is thus completed, audible signals will be sent back to the calling subscriber to indicate that the station is being rung or that the line is busy.

If the call had been for another subscriber in the same office, GARfield, instead of in the PENnsylvania office, it will be noted that the call would be routed from the "district selector" to an "incoming selector" in the same office and thence to the particular "final selector" in which the desired subscriber's line is located.

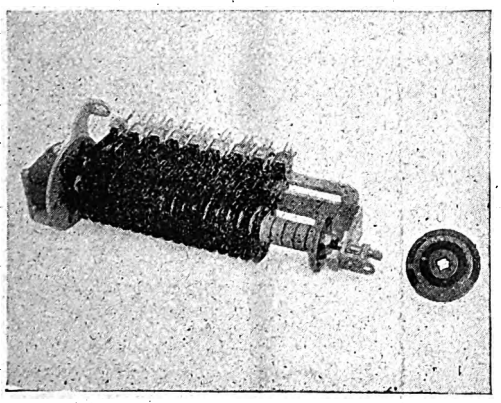

FIG. 6. SEQUENCE SWITCH WITH A TYPICAL CAM EXPOSED.

As soon as the subscribers have completed conversation and hung up their receivers, the connection through the automatic machinery is immediately disconnected and the apparatus returns to normal.

Previous mention has been made of the fundamental similarity between the processes in the mechanical and manual systems and to those familiar with the operation of manual systems, the progress of a call as just described, very strikingly brings out this point.

If the call from GARfield had been for a subscriber connected with a manual office, NORth, the "sender" would have so guided the district and office selectors as to have caused them to select a path or trunk leading to the manual office desired, where the trunk would have terminated in a cord before the operator at what is called a "call indicator position." A lamp would have been lighted and the operator upon depressing a key associated with that trunk would have allowed the distant "sender," that is at GARfield office, to cause the numerals of the line desired to be displayed before her on a "call indicator," whereupon she would, by means of a cord, connect the trunk with the multiple jack of the line desired, and ringing would be started automatically. It will be observed, therefore, that so far as the GARfield subscriber is concerned, he is not aware of the fact that in the case of the PENnsylvania office call, his subscriber is in a machine switching office, and in the case of the NORth office, in a manual office.

If a call is originated by a subscriber connected to a manual switchboard for a subscriber connected to a mechanical office, it may be handled in a number of ways, depending upon the type of equipment installed. The simplest plan is to place a "B" switchboard in each full mechanical office and let all incoming calls from manual offices be ordered up by the manual "A" operators over a call wire through this "B" operator. The operator at the mechanical office is known as a "cordless B operator" and establishes all connections to the mechanical subscribers in her office through the medium of an adding machine like key set which controls the automatic switches. Another is called the "key-indicator" plan, wherein the manual "A" operators may complete their own connections in the distant full mechanical offices by the use of a key set.

Fig. 9 is a general view of a mechanical switching office, showing the various classes of selector frames arranged in bays.

Fig. 10 shows a typical installation of cordless "B" positions in a machine switching office, which are used to complete the calls originating in a manual office.

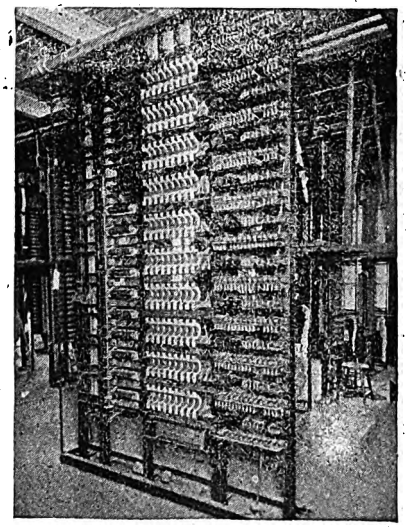

FIG. 7. SENDER EQUIPMENT IN PROCESS OF ASSEMBLY AT FACTORY.

Fig. 11 shows an operator's position in a manual office arranged for "call indicator" operation, that is, for completing in the manual exchange calls originating in a mechanical office.

Fig. 12 shows in detail one of the call indicators where the number is displayed with letters and digits illuminated by small electric lamps.

This system is the result of the combined efforts extending over a long period of a large technical

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staff, in co-operation with the general engineering staff of the American Telephone and Telegraph Company, and although we have embarked upon a manufacturing program which is already making necessary extensive additions to our manufacturing plant, there still remains a tremendous amount of engineering and development work, to adapt the system to the particular service conditions as they are encountered in various localities. At the present time the engineering department at West Street, New York, is devoting a very substantial part of its effort to machine switching work. Because of the newness of the system and the comparative inexperience of the manual switchboard editing personnel, the engineering department at New York is doing all of the equipment engineering in connection with the first offices in any given territory, the plan being that as rapidly as possible this equipment work will be transferred to the switchboard editing engineering group at the Hawthorne works. As a matter of fact, a very heavy schelude on this class of work is now being carried by the latter organization.

To convey an idea of the magnitude of the work involved in getting out the detailed plans for a machine switching central office, we should first start out with the picture that a machine switching office for a given number of lines contains about twice as much apparatus as a similar size manual office. Not only must there be provided machinery for performing the purely mechanical functions that have heretofore been supplied by the operator, but there is an additional element which has been previously touched upon, which serves as a substitute for the intelligence of the operator, namely, the "sender," and while in number of parts and size of equipment, it does not loom very large from a manufacturing standpoint, the intricacy of the circuit arrangement and the precision with which the various elements must function, provide a very complicated engineering problem, which must be worked out in detail to meet the service conditions as they appear.

To give an idea of what this "sender" really does, it may be of interest to enumerate some of its stunts.

1. It receives a succession of electrical impulses on a decimal basis and translates them to a non-decimal basis corresponding to the particular group of lines and trunks that may be involved in the particular connection.

2. It receives impulses transmitted by the subscriber's dial as rapidly as they can be sent, but it controls selecting mechanisms which build up the connection to the desired party in such a manner that each mechanism is given the exact time required to perform its function without any waste of time.

3. It allows the subscriber in any office to be called by dialing the first two or three letters of the office name, together with the subscriber's number in that office.

4. It translates the office code dialed, so that the trunks to that office can be found by the switching mechanism, in any arbitrary position that the telephone company might find it desirable to place them.

5. The "sender" is capable of distinguishing at what class of office the connection will terminate. That is, if the call is to terminate at a mechanical office, the "sender" will arrange to govern the selection accordingly. If the call is to terminate at a manual office, the "sender" will recognize this and arrange to send out impulses to the call indicator equipment.

6. For the completion of certain calls, traffic conditions require the introduction of tandem points. The "sender" will recognize calls going via tandem points and will arrange to handle these correctly. The tandem point may be a manual one

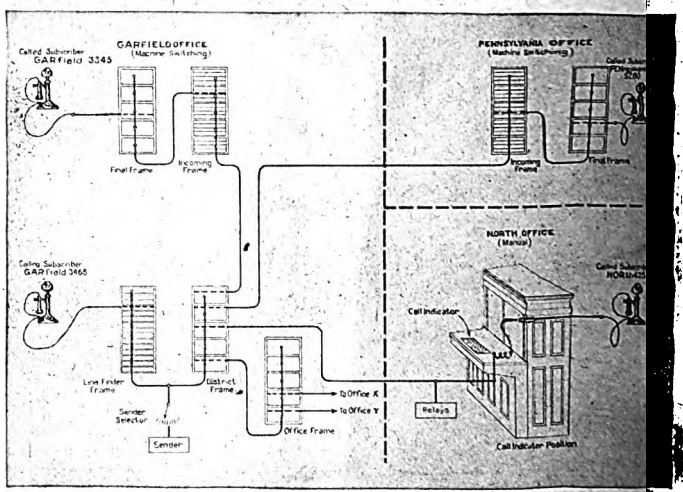

FIG. 8. DIAGRAM SHOWING PROGRESS OF A CALL FROM AN AUTOMATIC SUBSCRIBER OR TO ANOTHER AUTOMATIC SUBSCRIBER OR TO A MANUAL SUBSCRIBER.

or it may be a mechanical one, and the impulses must be governed accordingly.

7. The "sender" after recognizing the call's terminating office will know the class of trunk that leads to that office and arrange to adjust its electrical resistances so that all operations are made over practically uniform line resistances.

8. A switch, after selecting a group of trunks may find all of them busy. The "sender" will recognize this and immediately arrange to disconnect the train of switches and cause a busy tone to be given to the subscriber.

9. Certain "senders" are arranged to serve lines supplied with coin boxes.

These "senders" permit the subscriber to dial the number of the desired line before the coin is deposited, but will not allow the connection to be cut through so that conversation can take place until the coin is deposited. If the subscriber does not deposit the coin, after a reasonable time has

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lapsed, the "sender" will cause a monitoring operator to get in on the connection, and this operator will notify the subscriber of this omission. After he coin has been deposited, the "sender" will allow

answered, the "sender" would have caused the coin to be collected.

The "sender," in making a test of the calling line after the subscriber has completed dialing, to in-

FIG. 10. TYPICAL INSTALLATION OF CORDLESS "B" POSITIONS IN A MACHINE SWITCHING OFFICE.

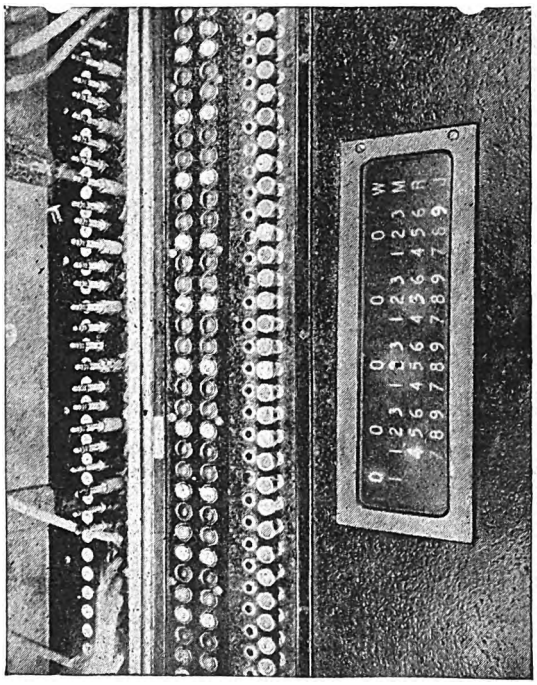

FIG. 12. CALL INDICATOR SHOWING THE NUMBER 4259 DISPLAYED.

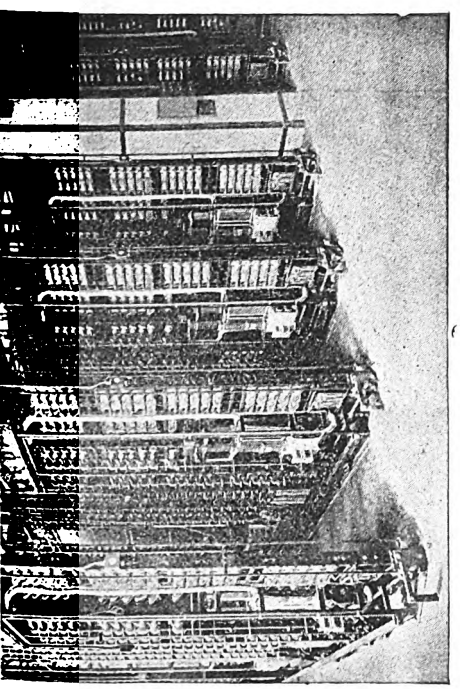

FIG. 9. GENERAL VIEW OF MACHINE SWITCHING INSTALLATION

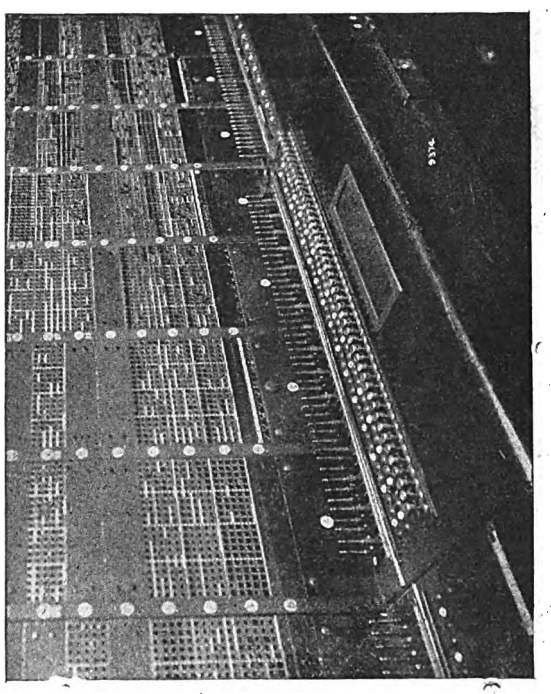

FIG. 11. OPERATOR'S POSITION IN A MANUAL OFFICE ARRANGED FOR "CALL INDICATOR" OPERATION

ie called subscriber to be rung and will permit the onversation. In case the called subscriber does ot answer, the "sender" will return the coin to ie calling party. Similarly, had the called party

sure the deposit of the coin, is capable of recognizing whether a coin has actually been deposited or whether the subscriber is trying to "beat" the instrument, in which case the abnormal condition

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is recognized by the "sender," and the call will be routed to a monitoring operator who will cause an investigation to be made.

10. In large areas, such as the New York metropolitan area, there are points, connection to which requires excess payment. Should a subs ber attempt to dial outside of the free area, his will automatically be routed to an operator will ascertain his wishes and make out the pr ticket.

So it will be seen that we are dealing here inanimate material which at times seems almos possess human intelligence.

Fig. 13 shows a section of the machine swi ing laboratory where all the new circuits and paratus are set up, wired in accordance with proposed plan, to make sure that their operatio satisfactory before actual manufacture of equipment is started. Fig. 14 shows a corne the laboratory devoted to the study of the desig machine switching apparatus, and here all new vices are subjected to extensive tests to deter their operating characteristics, length of life all other factors that may have a bearing on successful use in service. At the present time t are employed at West Street 350 engineers draftsmen whose entire time is devoted to the ther development of machine switching appar and circuits, and the engineering of specific chine switching equipments. In one month al something over 50,000 blueprints were made and issued, and over 3,000 equipment and ma facturing specifications prepared and issued. one machine switching office the engineering which has been recently completed, the equipm and circuit drawings covered an area of 5 square feet, and that was for only one set of d ings. So much for the preliminary enginee work that is involved in this new project of our

After all this work is completed the manu turing department is confronted with the prob of translating this information into shop langu making the detailed drawings of the apparatus, signing and constructing tools for its manufac and a thousand and one other details which m be provided before actual commercial produc can commence.

The fact that machine switching equipments now being manufactured and installed is an in tion of the intensive preparation work that has going on for the past few years.

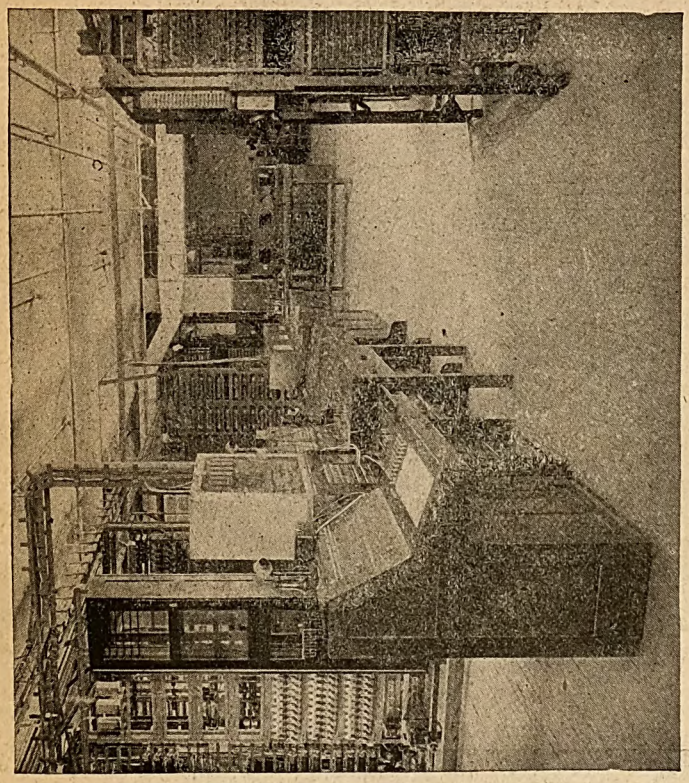

Fig. 14. One of the Machine Switching Apparatus Laboratories.

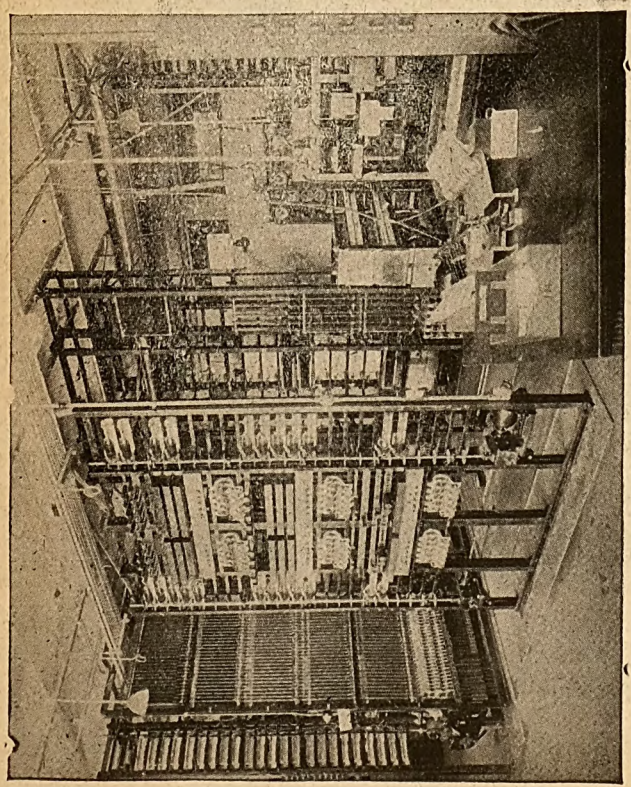

Fig. 13. One of the Machine Switching System's Laboratories.

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PRINTING TELEGRAPH SYSTEMS

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Telegraph Engineer, Western Electric Company, New York

(Continued from May 1 issue.)

Auto Stop. Although a skilled operator has no difficulty in maintaining an ample length of perforated tape between the perforator and the transmitter, conditions arise in normal operation when a perforating operator may have to suspend work temporarily. The transmitter, however, continues to feed forward the perforated tape and were no provision made, the tape would become torn as soon as the slack was taken up between the perforator and the transmitter. This is taken care of by a device, termed the "auto-stop," which consists of a light lever and a differentially wound relay connected as shown in Fig. 26 (See May 1 installment). The lever is so placed between the perforator and the transmitter that the slack perforated tape sags beneath it, but does not touch it. The weight of the long arm of the lever ensures the contact at *C* being closed. The stepping pulse from the local ring of the distributor to the transmitter magnet has two paths, one via contact *C*, the other via contact *D*. Consequently, the current divides equally between the differential windings *L* and *R*, of the relay, which remains inoperative. Whenever the sag in the tape is taken up sufficiently to carry with it the contact lever, the contact at *C* is opened, so that the next stepping inpulse from the local ring of the distributor passes through one winding only of the differential relay and actuates the relay. Its armature causes contact at *E* to be made and that at *D* to be broken. The relay is therefore locked up and the magnet of the transmitter is energized. So long as this condition is maintained the selecting pins of the transmitter are held in the position for transmitting the "blank" signal which has no effect whatever upon the printer at the distant station.

As soon as the operator commences perforating and the slack tape allows the contact lever to drop, the first "stepping pulse" will cause the unlocking of the differential relay and normal transmitting conditions to be restored.

Auto Control. While not an essential element of the system, the auto control is a desirable adjunct. In order to save time, it is advantageous to be able to signal the distant station operator without having to wait until a message in course of transmission has been completed, and it is essential that such signals shall not involve multilation of the printed record of such message.

This is secured by means of the "auto control" device which is connected in the circuit between the transmitter and the sending ring of the distributor. The "auto stop" feature is incorporated in this device, the circuits being inter-connected, but for the sake of clearness the auto control circuit alone is shown in Fig. 27.

The auto control, therefore, is a device for automatically stopping the transmission of a message and for sending over the line the necessary signals to ring a bell mounted on the printer, at the distant station. Provision is made for ringing the bell

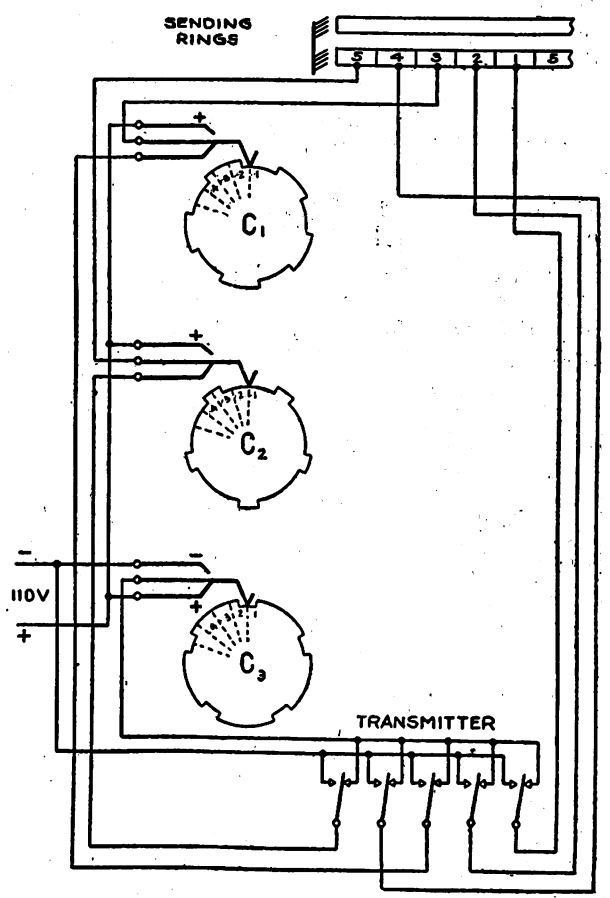

FIG. 27.

once, twice, up to five times in succession. A code of signals can be used. For example:

1 ring may mean "stop"
2 rings " " "rerun last message"
3 rings " " "repunch " "
4 rings " " "start"
5 rings " " "attendant" or "supervisor."

The auto control consists of a starting sector or handle with five finger positions connected to a small spring motor, three cams rigidly mounted on

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a spindle acting upon three separate groups of contact springs and an escapement wheel controlled by an electromagnet. The starting handle is actuated by inserting a finger in one of the five finger positions and pulling it forward to its starting position which is determined by a finger stop. The spring motor is wound up by this forward movement and when the finger is removed, the motor causes the spindle carrying the three cams to be rotated, at the same time restoring the handle back to normal position. The "stepping pulses" which normally actuate the electromagnet of the transmitter are diverted so as to actuate the electromagnet controlling the escapement wheel of the auto control device so that the cams are rotated one step for each "stepping pulse."

In order that the circuits may be readily traced, dotted lines have been drawn to show the position of the middle springs on the cams at each step. The normal position of the springs is shown in Fig. 27.

The first step, that is, to position maked No. 2, causes the middle spring of cams 1 and 3 to be raised. The polarity of the right hand contacts on the transmitter is changed from positive to nega-

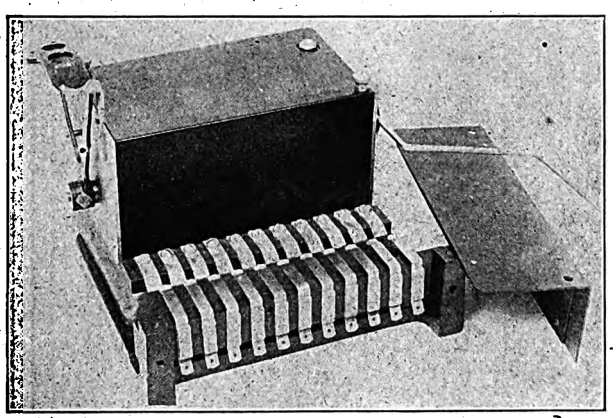

FIG. 28.

tive by the action of cam 3 while the actuation of the spring on cam *C*1 causes segment 3 on the sending ring to be connected to the positive line battery, irrespective of the polarity applied to the third contact lever of the transmitter. Consequently, the five segments will send — — + — —, which is the "figure shift" signal. This will actuate the printer at the distant station and adapt it for "upper case" operation. The next step forward of the cams will cause all springs to be raised. This will reverse the polarity applied to the fifth segment so that the next signal transmitted will be — — + — +, which in the "upper case" is the combination for "signal" or "bell." The effect of this will be to cause the bell to ring at the distant station printer.

At the third step of the cams, the middle spring of cam 3 only will be raised, so that negative voltage is applied to all segments. This is the "letter shift" signal and causes the typewheel of the printer to be restored to normal. The fourth step restores the circuit conditions to normal ready for transmitting direct from the transmitter.

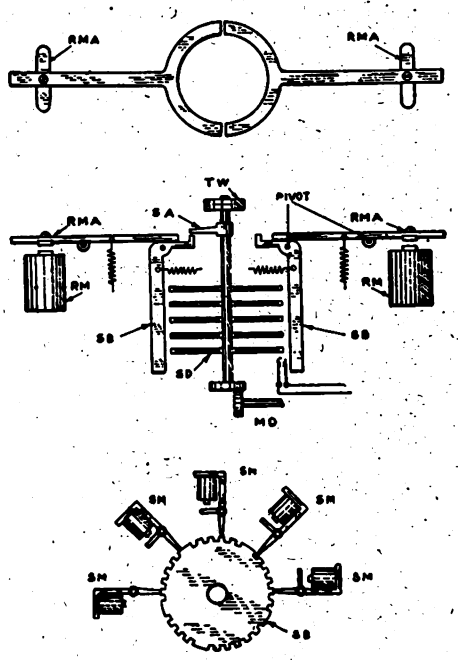

FIG. 29

This cycle of operation is repeated one, two, three or four times, according to the setting of the handle. None of the signals transmitted by the auto control device actuates the spacing or lateral movement of the paper carriage so that the auto control may be operated while the printer is in the

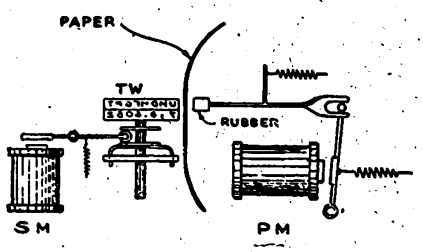

FIG. 30.

middle of a word. When the auto control signals have been sent, the normal transmission of the message continues and the printer completes the unfinished word.

Printer. The printer is of the movable paper carriage type, and all operations such as causing the paper carriage to be returned for the printing of a new line and moving the paper upwards equal to the distance between lines, are performed automatically under control of signals from the sending station.

A typewheel, *TW*, Fig. 29, mounted on a vertical shaft, is made to rotate by means of a small electric motor. Projecting from the typewheel shaft is a short arm *S A*, the free end of which just clears

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the ends of the selector bars *S B*. When stopped by a raised selector bar, the typewheel is so positioned as to print the particular letter associated with that selector bar. Normally, the selector bars are held down by the semicircular ends of the

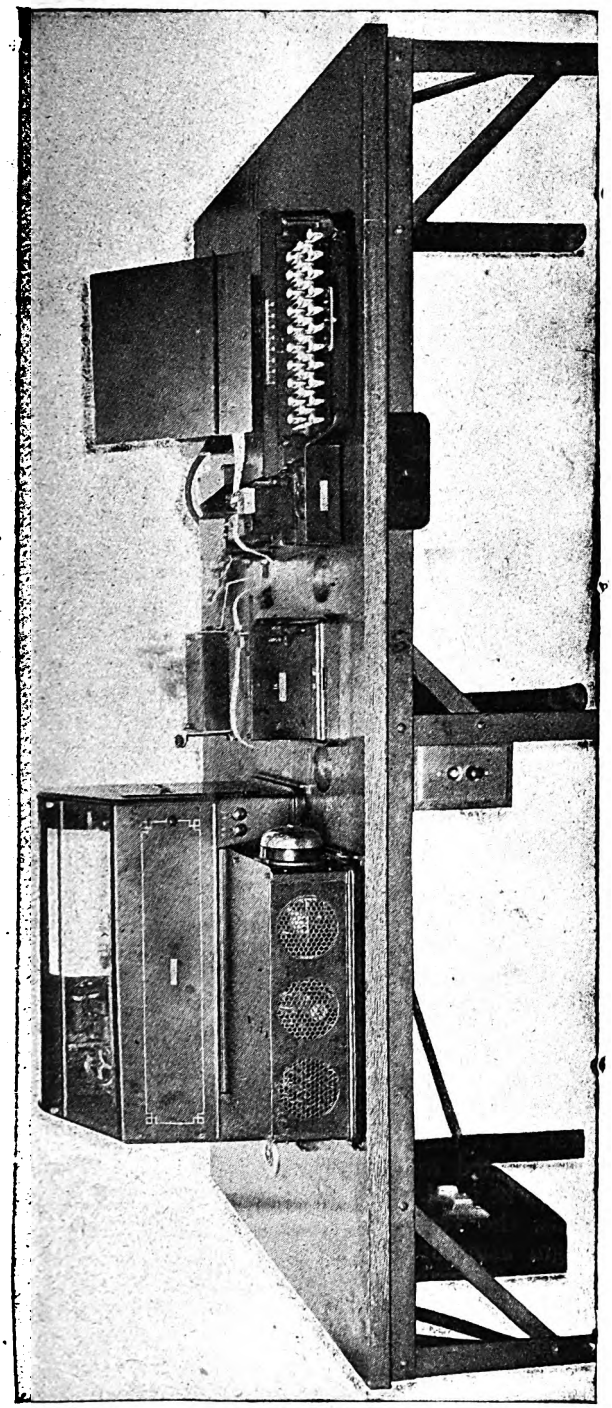

FIG. 31

armature levers *R M A* of two release magnets *R M*, Fig. 29.

The five horizontal selector disks are mounted around a hollow drum or shaft enclosing the typeshaft. Each disk has notches so arranged around its periphery, that when one of the disks is moved through a small angle, a notch on each of the disks will be in vertical alignment so as to permit the vertical leg of one selector bar to move inwards. If two disks are moved the alignment of notches will occur opposite another selector bar, if three disks are moved the alignment will take place opposite still another selector bar and so on. With five selecting disks 32 possible selections are available. There are 31 selecting bars, each one of which is associated with a character to be printed, or contacts to be closed to cause one of the several functions which the printer has to perform. One selection is not used, since it is desirable to have one combination which will cause no operation in the printer. The selector bar on the right, Fig. 29, is shown as a function or "stunt" bar. These functions are "space," "carriage return," "line feed," "figure shift," "letter shift" and "bell."

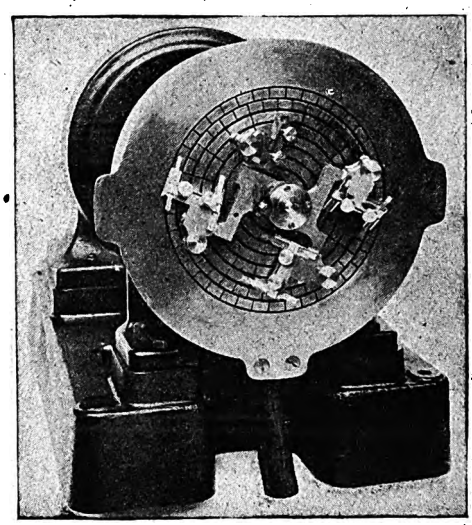

FIG. 32.

The typewheel is mounted on the typeshaft in such a manner that it may be raised so as to bring a second row of characters opposite the printer hammer. This operation is performed by means of the shift magnet *SM*, as shown in Fig. 30. When the "figure shift" signal is received, a "stunt" bar is selected and closes the contacts of the shift magnet *SM*. When the "letter shift" signal is received, another "stunt" bar is selected, which opens the circuit of the "shift magent" and the typewheel is brought down to its normal position.

The paper on which the messages are printed is fed round the platen of the paper carriage which slides laterally on a square shaft. Fig. 31 shows an operating table with all equipment in position.

Distributors. The distributor face plate consists of eight rings, four being solid and four segmented, as shown in Fig. 32. The rings are associated in pairs, one segmented and the other solid. The two brushes which sweep over the two rings of a pair are in electrical contact with each other so that the solid ring is connected in sequence to all the seg-

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ments of its associated ring, once per revolution. The outer or receiving ring has 40 segments and is associated with the fifth ring. The second or correcting ring (40 segments) is associated with the sixth ring. No. 3 is the sending ring (20 segments) and is associated with No. 7. The innermost segmented ring (20 segments) is termed the "local" and is associated with the innermost solid ring. The brushes are made from thin copper wire and make contact on one segment only at a time. They

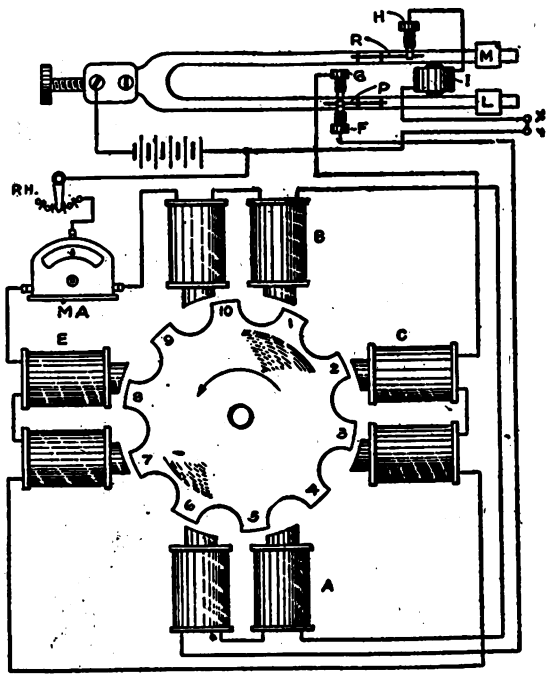

FIG. 33.

are mounted on a balanced brush holder which is carried by a spindle projecting through the center of the face plate.

Two types of distributors have been designed, one in which the brush holder spindle is directly connected to the shaft of the driving impulse motor and the other in which intermediate gearing is introduced between these parts, for a purpose which will be described later.

The La Cour or phonic wheel motor together with the electrical driving fork is shown in schematic form in Fig. 33.

The fork carries two contact springs *R* and *P* in electric contact with the fork itself. Mounted below the tines of the fork is an electromagnet *I* for causing the fork to vibrate. When the tines are not loaded with weights *M L* the fork vibrates at the rate of approximately 55 cycles per second. If a slower rate is desired, weights are fixed on the tines as shown in the figure. The rate of vibration can be varied between 25 and 55 cycles by this means. Provision is made for effecting small changes in speed, by means of additional weights near the base of the fork, which are so mounted as to be slidable along the tines by an adjusting screw operated by a handle or knob at the end of the fork. This adjustment can be made while the fork is in vibration. In the case of a quadruple or a four arm installation, the speed of the fork in cycles per second corresponds to the speed of operation of each channel in words per minute, so that if the fork vibrates at 50 cycles per second each transmitter operates at a speed of 50 words per minute.

The phonic wheel motor has an armature so shaped as to form ten teeth or polefaces, equally spaced, around the periphery. Mounted 90 deg. apart are four electromagnets with polefaces shaped so as to be concentric with the edge of the polefaces or teeth on the armature.

The electromagnets diametrically opposite are connected so that *A* and *B* (see Fig. 33) are energized together and *C* and *E* together. Consequently, when the fork is vibrating, *A* and *B* will be energized alternately with *C* and *E*. The number of the polefaces on the armature is such that the armature makes one complete revolution during ten complete vibrations of the fork. The differential milliammeter *MA* shown in the figure is for the purpose of indicating whether the adjustment of the fork contacts in the motor circuits is correct.

(*To be concluded in June 1 issue.*)

Sensitive Telegraph Receiver.

William E. Peirce, the well known telegraph inventor, recently was granted a patent covering a receiver for high frequency signals received over telegraph wires. The new device is based upon the principle of a telephone diaphragm receiver, but Mr. Peirce has succeeded in designing a type of receiver with an armature attachment which permits of using the receiver as a relay for the operation of a local circuit containing a telegraph sounder, tape recorder, or other reading device.

The system has been successfully tried out over comparatively long lines already in use as single line, duplex, and quadruplex Morse circuits. The transmitting current is of high frequency, and of low current value, and may be passed over regularly operated telegraph lines without affecting the operation of the Morse apparatus.

It is stated that the receiver is sufficiently sensitive to be used in the reception of radio telegraph signals, the received impulses actuating the diaphragm armature so that it in turn operates an ordinary telegraph sounder.

Telegraph Service in Alabama.

On account of the Supreme Court decision ordering the Western Union Telegraph Company to remove its wires along the line of the Louisville and Nashville Railroad, in Alabama, twenty towns situated on that road, heretofore served by these wires, are likely to be without commercial telegraph service until other arrangements are made to provide service.

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Radio Telegraphy

Radio Corporation of America Notes.

E. J. NALLY, president, accompanied by Plant Engineer Reoch, and Supervising Architect Edwards, recently made an inspection of the New Brunswick, N. J., station.

E. B. PILLSBURY, general superintendent, has returned from an inspection trip to the Boston, Mass., office and the high power stations on Cape Cod.

LEE LEMON, assistant to the president, recently spent several days at the high power stations at Belmar and Lakewood, N. J.

H. W. ALLEN, joint general manager, and W. R. Cross, traffic manager of the British Marconi Company, London, arrived in New York recently for a stay of some weeks, on business of the company.

A COMMISSION representing the Danish government is now in this country for the purpose of inquiring into the extent and growth of radio telegraphy in America, and making preliminary arrangements for the establishment of direct communication between the two nations. T. K. Krarup is chairman of the commission He is the head of the public works in the Danish ministry. The other members of the commission are R. N. A. Faber, captain in the Danish Engineer Corps; P. O. Pederson, professor in the Copenhagen Polytechnical School; H. J. C. Schledermann, chief electrical engineer in the Danish navy, and W. G. Thomson, chief engineer of the Danish telegraphs.

J. D. WHITE and Dr. N. W. McLachlan, of the engineering department, British Marconi Company, have arrved in New York for the purpose of investigating late improvemnts in radio engineering.

Independent Wireless Telegraph Company.

CHARLES J. PANNILL, vice-president of the company, spent the last week of April in Washington on company affairs.

THIS COMPANY has received an order from the New York and Cuba Mail Steamship Company for fourteen radio telegraph outfits, to be installed on the company's new vessels.

FRANK A. HART has been appointed operating manager, with offices at No. 18 Murray Street, New York.

IN A RECENT TEST on coastwise ships, apparatus manufactured and installed by the company developed an operating range of 500 miles in daylight.

J. D. HAIG has joined the forces of this company and has been assigned to duty in the Philadelphia, Pa., office, relieving R. I. Young, who goes to the Jacksonville, Fla., office.

THIS COMPANY has erected a modern radio station in New York, which is controlled from the operating department at No. 18 Murray Street.

British Radio Stations.

The National telegraph system radio stations taken over by the admiralty during the late war have been returned to the postoffice telegraph authorities. The radio stations now operated by the postoffice are:

Wick	2 K. W.
Lerwick	2 K. W.
Stonehaven	30 K. W. and 5 K. W.
Cullercoats	5 K. W.
Scarborough	2 ½ K. W.
Grimsby	1 ½ K. W.
Caister	1 ½ K. W.
North Foreland	1 ½ K. W.
St. Catherine's	1 ½ K. W.
Bolt Head	3 K. W.
Guernsey	1 ½ K. W.
Land's End	5 K. W.
Fishguard	3 K. W.
Seaforth	1 ½ K. W.
Port Patrick	2 K. W.
Tobermory	1 K. W.
Lochboisdale	1 K. W.

These stations are used for ship and shore and other medium distance communication.

Radio Club of America.

At the regular meeting of the Radio Club of America, held on the evening of April 30, in the Engineering Building, Columbia University, New York, a paper was presented by L. A. Hazeltine, entitled "Bulb Oscillators for Radio Transmission." The paper dealt with the theory and design of oscillating circuits for radio transmission, special circuit arrangements for power oscillators being shown. Professor Hazeltine described various difficulties which the amateur radio experimenter might encounter.

Institute of Radio Engineers.

At the Institute of Radio Engineers' regular meeting, held on May 5, in the Engineering Socities' Building, New York, Dr. L. W. Austin, head of the United States Naval Radio Telegraph Laboratory, presented a paper entitled "The Relation Between Atmospheric Disturbances and Wave Length in Radio Reception."

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SUBMARINE CABLES

CAPTAIN F. H. LARDNER, commander of the Commercial Company's cableship *Mackay-Bennett*, was decorated with the Order of the British Empire by the King of England, at Buckingham Palace, on April 22, in recognition of his work during the late war in effecting repairs to cables laid in the Atlantic ocean.

S. F. AUSTIN, of the Commercial Cable Company, who has been stationed at Havana, Cuba, during the past winter, returned to headquarters, New York, on April 23.

JOHN P. CROWLEY, who served with the Direct United States Cable Company as an operator for more than thirty years, and who became a Western Union employee when the latter company took over the lines of the Direct Company, died at his residence in Brooklyn, N. Y., on May 2.

Delays to Submarine Cable Traffic.

In response to a recent letter from the Merchants' Association of New York, relative to cable delays, Mr. George Clapperton, traffic manager of the Commercial Cable Company, sent a reply as follows:

"We refer to your letter of April 3 in regard to complaints of delays in the transmission of cablegrams generally, but especially to and from Singapore in one direction and to and from Porto Rico in another direction.

"There have been delays in all directions and they are to be attributed to the causes to which all delays are to be attributed, either one or both, heavy traffic and shortened facilities.

"The cases of Singapore and Porto Rico may be taken as examples.

"The Commercial Pacific cable broke on January 31. There was no communication by it between January 31 and February 27.

"The British Pacific cable broke on February 26. There was no communication by it until March 8.

"During these periods all the traffic ordinarily carried by these cables to and from the Philippines, China, Japan, Siberia, Australia, New Zealand, great accumulations in the case of both broken cables were thrown in bulk onto the Atlantic cables, creating congestion there and on the Eastern Company's cables beyond the Atlantic to the Near and Far East.

"The Atlantic system was short of cables. The principal shortage in the Commercial system was the loss of the cable to France, interrupted from February 6 to March 20, in a locality subject to such tempestuous weather that the ship ready for the repair was unable to put to sea, and was compelled to shelter in the nearest available port. We issued daily notices of delay.

"An important line to the Far East runs through France to Marseilles and the Mediterranean. The British Administration recently issued notices of heavy delays beyond Great Britain on account of the disorder of the telegraph facilities in France and on the continent generally.

"In the London Times of March 22 there is a complaint of seven days' delay to Africa. Cablegrams for Africa and Singapore leave England by the same cables. We cannot reconcile that complaint with the statement that messages are arriving in London in two days from Singapore, but it may be an indication of irregular service consequent on abnormal conditions.

"Now as to Porto Rico. There are three routes to Porto Rico. The most direct is by the United States and Hayti Cable from New York to Cape Hayti; the next from New York via Cuba and Jamaica; and the third via Cuba and Hayti by means of a cable line from Santiago de Cuba to Cape Hayti.

"The New York-Hayti cable broke on March 6.

"The Jamaica-Porto Rico cables broke last January, and so far have resisted the efforts made to repair them.

"The only remaining route, via Cuba-Hayti, was congested with the traffic of all three.

"The New York-Hayti cable was restored on March 20, and no doubt the delays which provoked the complaints have disappeared. The system is not under this management, but we have stated the facts."

Cable Staff Transfers.

EASTERN TELEGRAPH COMPANY: L. J. Cripps and C. G. Baker, from Gibraltar to Suez; E. Chivers, London to Banana; A. A. Channens, Suez to Aden; W. J. Elma, Porthcurnow to Marseilles; H. Brett, Aden to Colombo; A. N. Swayne, Mozambique to Zanzibar; A. Hendry, Beira to Durban; H. T. K. Gillon, Quelimane to Durban; A. J. Lamb, Durban to Delagoa; E. W. Appleby, Delagoa to Durban; C. R. Cox, Mozambique to Zanzibar; A. E. Cheeseman, Marseilles to Aden; N. Le-Rougetel, Carcavellos to Durban; R. Evens, H. E. Allan and E. G. Law, Alexandria to Aden.

THE CABLESHIP *Minia* during the past month has been engaged off the coast of Ireland, repairing cables.

THE SPANISH GOVERNMENT, it is reported, intends laying a submarine cable between Cadiz, Spain, and Larache, Morocco.

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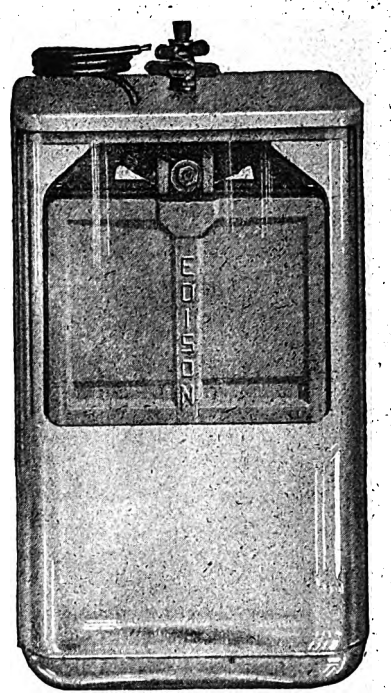
FOR CLEAR TRANSMISSION



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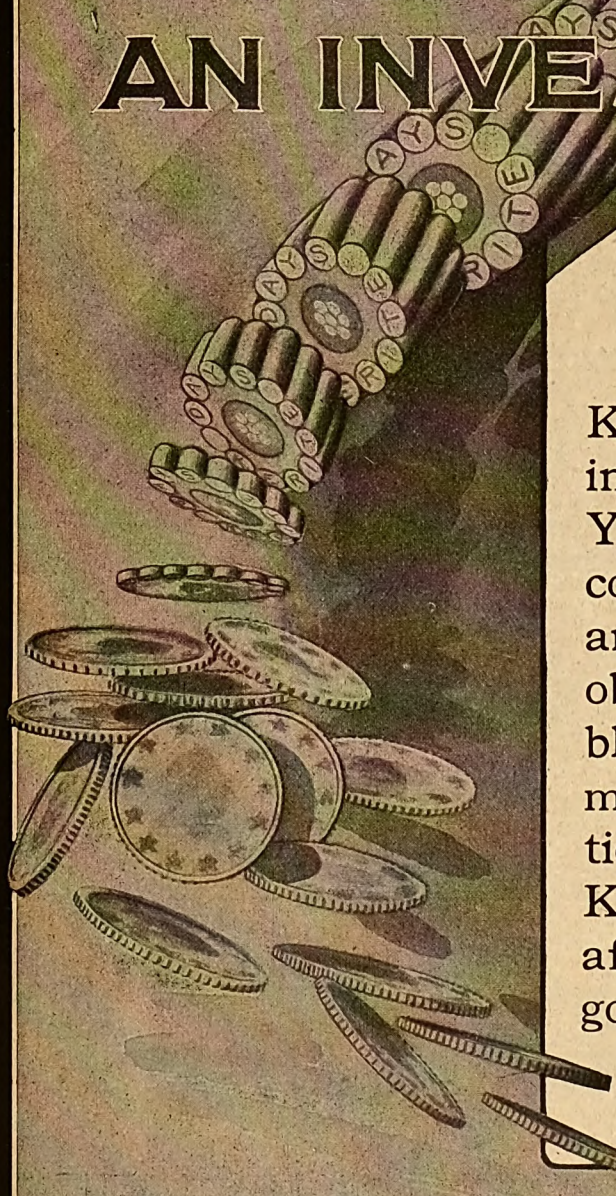
AN INVESTMENT



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Canadian Telegraph Items

Great North Western Telegraph Company.

The "over-alls movement" which sprang up recently across the line, has taken root in the Toronto office of this company, and it is proposed that all members of the force shall have an opportunity to wear the new raiment. A ladies' committee has arranged for the manufacture of plain denim dresses, with white collar and cuffs optional. The men will wear either denim or khaki suits.

THE OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION, of which George D. Perry, general manager of the Great North Western Telegraph Company, is president, will hold its annual convention this year in Toronto, August 31 to September 2. Since its organization, in the year 1861, the Association has met in a Canadian city only once—in Montreal in the year 1901. The co-operation of every telegrapher in the Dominion, who is eligible for membership, is being enlisted to make this year's meeting a success. Membership requires that the applicant was in the telegraph business twenty-five years prior to date of making application, and that he remained in the business at least five years.

OWING TO RECENT PROMOTIONS, W. G. Barber, district superintendent, Toronto, now has an entire new staff of inspectors in the personages of Messrs. W. T. Kew and H. Dowson, who both started in the telegraph game with this company.

Mr. Kew, who entered our service in September, 1911, recently returned from overseas, after four years' service with His Majesty's forces.

Mr. Dowson entered our service in March, 1908, and has been manager of the Riverdale branch office, Toronto, since September, 1917.

MISS E. NEVILLE, of the bookkeeping department, Toronto office of the Great North Western Telegraph Company, retired from the service on April 30, after forty-five years' continuous employment with the company. Upon leaving the service Miss Neville was presented with a purse of gold by her telegraph associates and friends. The presentation was made by W. G. Barber, district superintendent.

IN COLOMBIA, the municipal council of Barranquilla has called for bids for the establishment of a modern telephone system in that city.

IN ECUADOR, work is progressing rapidly on the new radio telegraph station at the national capital.

OLD TIMERS MEET IN TORONTO, AUGUST 31 TO SEPTEMBER 2, 1920.

The Old-Time Telegraphers' and Historical Association, at the annual reunion held in Cleveland, Ohio, in September, 1919, decided to hold the 1920 gathering in the city of Toronto, Ont., and elected George D. Perry, general manager of the Great North Western Telegraph Company, president of the Association.

At a recent meeting of the Toronto committee on arrangements, Thomas E. Fleming, secretary of the Association, was present, and the dates selected for the convention are August 31 to September 2, 1920.

The last time the Old Timers met in Canada was in the year 1901, when the meet was held in Montreal. At this convention all those who attended stated that the occasion was the most enjoyable of any attended, and this year the Canadians plan to give the veteran telegraphers from the United States a reception which in cordiality and in entertainment furnished will measure up with the best they have had at any past convention.

Throughout Canada a great deal of interest is already being manifested by telegraphers, in the approaching reunion in Toronto, and as this has the added attraction of coming in the first week of the world famous annual Canadian National Exhibition, held in Toronto yearly, there is no doubt as to the large attendance of members of the Association and their families. Adequate provision will be made for the comfort of all telegrahpers from the United States and Canada who foregather in Toronto during the period of the convention.

H. HULATT, manager of telegraphs, Grand Trunk Pacific Railways, Montreal, Can., was a New York business visitor on April 28.

New ***RADIO*** *Book*

"ELEMENTS OF RADIOTELEGRAPHY"

By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Students' Course in Technical Telegraphy

No. 5

In the May 1 installment of this series of articles an attempt was made to explain in plain words what is meant by Ohm's Law, and our recommendation is that the student re-read that article until he understands the relationship existing between ohms, volts and amperes. The subject is really very simple, and we can assure the reader that a knowledge of Ohm's Law brings to the student a sense of mastery which enables him to make rapid and sure progress in electrical studies.

Magnets and Electro-magnets.

The electric current used to operate telegraph lines and instruments is supplied from primary batteries, storage cells, or from small dynamos driven by electric motors.

Motors, dynamos, telegraph relays, sounders, transmitters, and all other such devices do the work required of them as a result of the existence of electromagnetism.

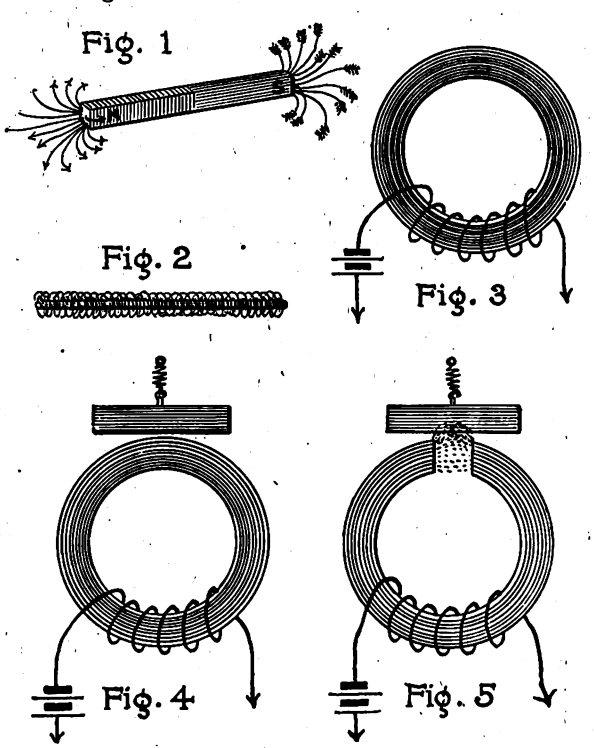

Fig. 13.

In Fig. 13, at 1, is shown a bar-magnet, or permanent magnet. The arrows illustrate the direction of flow of magnetic lines from the north pole around to the south pole of the magnet. In the case of permanent magnets this flow of magnetic force continues indefinitely without interruption. Bar magnets are made of steel. Electro-magnets, on the other hand, consist of cores of soft iron around which are wound many convolutions, or turns, of insulated wire. When the wire circuit around the soft iron cores is connected with a battery or other generator of electricity the cores become magnetic, but as soon as the wire circuit is opened or the battery disconnected the cores lose their magnetism.

In Fig. 13, at 2, is shown a short section of wire through which a current of electricity may be imagined to be flowing. One effect of the flow of current is that iron objects in the immediate neighborhood of the wire become magnetic and continue in that state so long as they remain in close proximity to the wire, or until the wire circuit is interrupted, stopping the flow of current. At 2, in Fig. 13, the magnetic force surrounding the wire is represented by rings or loops around the conductor.

At 3, Fig. 13, is illustrated a continuous iron core around which is wound several turns of insulated wire connected to a primary battery of two cells. One pole of the battery is grounded while the remote end of the wire circuit also is grounded —making a closed circuit through which current flows. In this case the magnetic lines of force have a continuous, uninterrupted path through which to circulate. If we bring into the neighborhood of this closed magnetic circuit an iron armature, as shown at 4, Fig. 13, very little attraction will exist between the core and the armature; but if the core is split, or has a section removed, as shown at 5, then the magnetic path is interrupted and the lines of force exert an influence across the intervening space. It may be observed, also, that the distance between one of the open ends of the core, and the armature, is less than the distance across the gap between the two ends of the core. This means that the magnetic lines in their effort to bridge the gap find a shorter path by way of the armature, with the result that the armature is attracted toward the core, and will remain in contact with it so long as current is allowed to flow through the wire circuit. As soon, however, as the wire circuit is interrupted, or the battery disconnected, the retractile spring shown above the armature withdraws the latter away from the core.

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The operations here considered are identical with ɔse which take place in the operation of telegraph ɜtruments equipped with electro-magnets.

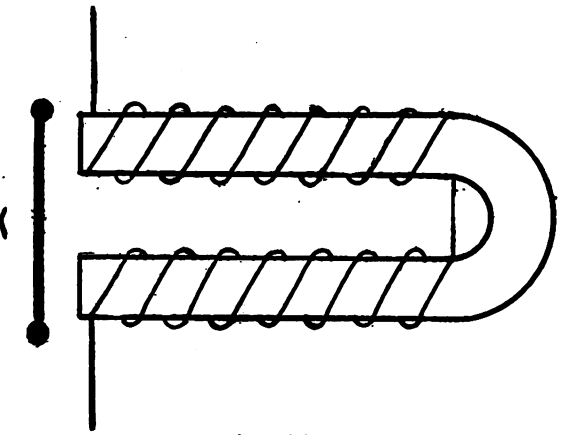
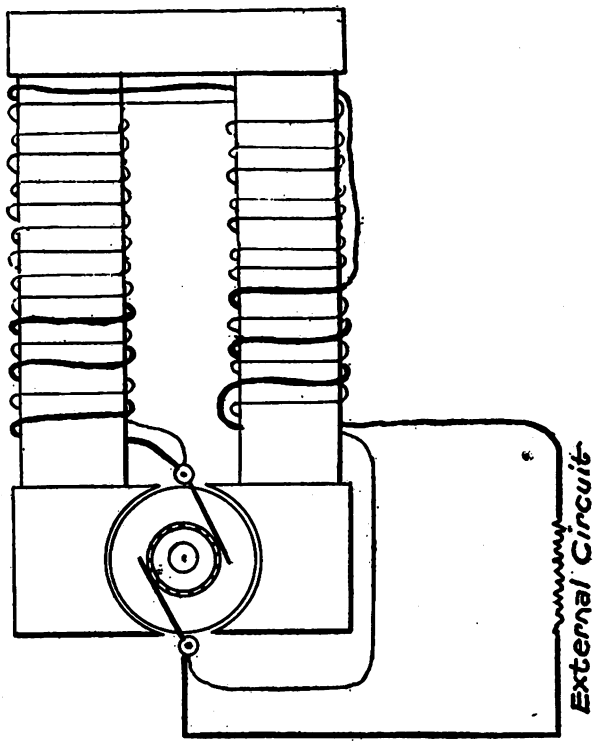


FIG. 14.

In Fig. 14 is shown a modification of the circular ɾe which is in the familiar form of a horseshoe. he cores of a telegraph relay, or sounder, are pat-rned in this fashion, except that instead of one ntinuous iron core being used, two cores of soft ɔn are joined at one end by an iron "heel-piece." Fig. 14 several turns of insulated wire are wound the core, the direction of the winding being such at one of the poles presented to the armature *K*, ill be of north polarity and the other of south ɔlarity, when current is caused to flow through the ire circuit. The amount of magnetism produced up to a certain point, increased by increasing e number of turns of wire placed on the core.

Motors and machine generators of electricity ıve cores and magnet windings very much the me as telegraph relays. In Fig. 15 is illustrated e principle upon which most direct-current gen-ators are designed. The two upright sections are ɾes, or "field-pieces" made of soft iron, while at e top the extremities of the cores are joined a yoke, also of iron. At the bottom the cores e equipped with iron extremities so designed that e armature upon which is wound many coils of ɾe may revolve between them when driven by a ɔtor or other external source of power.

The generator illustrated in Fig. 15 shows what is termed a compound-wound generator, widely used in telegraph practice. The two wires leading from the machine and connected to "external circuit," are the wires which are connected to line wires, sounders, and other instruments in the operating room.



COMPOUND WOUND.

FIG. 15.

It is thought best not to devote time to a study of the construction of motors and generators, as it is seldom that telegraph supervisors, wire chiefs, or junior engineers have as a part of their duties repairing defects in these machines. Of course, an understanding of the design and makeup of the various types of motors and generators is valuable, but a consideration of the subject may advantageously be put off until other more directly important matters have been gone into.

(*To be continued in June* 1 *issue.*)

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH COMPANY.

RECENT VISITORS at the executive offices included J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad, and T. R. Terhune, district commercial manager at Nashville, Tenn.

WILLIAM R. SHEARER, formerly wire chief at Jacksonville, Fla., has been transferred to the division office at Atlanta, Ga., as engineering assistant, vice C. A. Bowen, deceased.

B. F. MORRIS has been appointed acting chief operator at Detroit, Mich., vice G. A. McDonough, resigned.

E. W. PITTMAN was, on May 1, appointed chief operator at Little Rock, Ark., vice T. J. Richmond, furloughed.

T. D. DANIEL was, on May 5, appointed chief operator at Muskogee, Okla., vice W. G. Sublette, transferred to Brownsville, Tex.

H. N. GURLEY was, on May 4, appointed chief operator at Beaumont, Tex., vice T. D. Daniel, transferred.

A CONFERENCE of district superintendents and office managers was held at Wilmington, Del., on April 23 and 24. Traffic matters were discussed.

Death of J. B. Van Every.

John Brock Van Every who, until his retirement some years ago, was vice-president of the Western Union Telegraph Company, died on April 27, at his home in New York. Mr. Van Every entered the service of the company in 1864, in the auditor's office. In 1872 he was appointed auditor, and in the year 1879 was advanced to the position of vice-president. At the time of his death he was eighty-one years of age.

AT SALT LAKE CITY, UTAH, on April 19, there was a meeting of Mountain Division officials, including A. B. Cowan, general manager, Denver; W. C. Tuttle, plant supervisor; E. E. McClintock, district commercial superintendent; C. J. Ince, division commercial manager, and R. Van Tine, division auditor. Robert E. Chetwood, plant engineer, of New York, was in Salt Lake City at the time on his way home from San Francisco, and spent the day in conference with the visiting officials.

Employees' Benefit Fund Committee Annual Report for 1919.

The Employees' Benefit Fund Committee of the Western Union Telegraph Company, in its annual report for the year 1919, shows that during the year sixty-seven (fifty-two men and fifteen women) were retired on pension. On December 31, 1919 there were 569 ex-employees on the pension roll—432 men and 137 women.

During the year 2,711 cases of sickness, involving disability of over seven days, were reported; a decrease from 1918 of 277. There were 1,582 employees reported injured in accidents which occurred in and arose out of the course of their employment. Of this number thirty were fatal and there were 111 deaths from other causes.

The report shows that since 1913 the disbursements of the fund have been:

Pensions	$1,530,756.6
Accident Disability Benefits and Expenses	403,710.7
Sickness Disability Benefits	1,163,013.2
Death Benefits	549,285.5
State Insurance	28,939.7
Total Disbursements	$3,675,705.8

Thomas W. Carroll is chairman of the committee, the other members being F. J. McLain, J. P. Edwards, Frank Kitton and Louis Fiedeldey.

Western Union, First District, Eastern Division.

C. G. HOPKINS, recently at Daytona, Fla., has returned to New York and is acting as relief manager in the first district, at present at Albion, N. Y.

W. A. COLTON of Brocton, N. Y., succeeds J. E. Carroll, transferred to the traffic staff at Buffalo, N. Y.

FRANCES WALSH, recently in the service at Canajoharie, N. Y., has been placed in charge of the General Electric Company's office at Schenectady, N. Y.

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MARJORIE HENDERSON, from Danville, N. Y., has ;en appointed manager at East Aurora, N. Y.

ETHEL F. RUBLEE, manager at Oneida, N. Y., has signed to accept a position with a brokerage com-ıny.

SEVERAL GROUP MEETINGS of managers have been ld at various points in the first district during the st two weeks.

New York Western Union.

WILLIAM LARKIN, manager of the telegraph sta-ɔn at Quarantine, New York harbor, and S. F. illips, manager of the office at Highlands, N. J., ere recent visitors in the main office.

G. W. HAMMELL, chief operator of the Atlanta, ., office, was a New York visitor on April 26-27.

J. O. CARR, engineer, Morkrum Company, Chi-go, was a New York and Boston business visitor ring the last week of April.

MISS EMMA RUSSELL HAMMELL, daughter of W. Hammell, chief operator, Western Union legraph Company, Atlanta, Ga., gave a song re-al in Æolian Hall, New York, on the evening of ril 26. The large auditorium was well filled with representative and appreciatve audience. The en-tainment was conducted under the management the Music League of America, Inc.

Philadelphia, Pa., Western Union.

THE DOT AND DASH CLUB will hold its annual en-tainment at the Hanover hotel on May 17. omas E. Fleming, of New York, and other ominent telegraph officials will attend.

W. M. PHILLIPS, commercial agent, was elected airman of the Publicity Committee, Philadelphia tary Club, on April 12. The Rotarians' annual ıvention this year will be held at Atlantic City, d this will place in the hands of the Philadelphia icials a large amount of work in caring for mem-rs passing through this city.

NEW BRANCH OFFICES were recently opened in Drexel building and the Lafayette building.

THE OFFICES OF District Plant Superintendent tman have been moved from the Pennsylvania lding to larger quarters at 12th and Sansom reets. The traffic department will take over ıce vacated in the Pennsylvania building.

LEW RILEY, absent for some time on account of ness, is recovering and expects to return to duty on.

DANIEL WIGGS has been transferred to the day rce and has been assigned to the Scranton, Pa., al.

Western Union, Eastern Division, Third District.

M. F. FORDHAM of Superintendent Horton's office has been appointed manager of the Montclair, N. J., office.

F. B. VANSCOY has returned to his duties as manager at South Norwalk, Conn., after an illness of several weeks.

A NEW OFFICE has been opened at Preston, Md., with Andrew T. Mason as manager.

NEW MANAGERS APPOINTED: R. H. Gallagher, Ansonia, Conn., F. J. Connelli, Norwich, Conn.; J T. Doran, New London, Conn., and R. E. Abel, Millville, N. J.

Lake Division, Western Union.

EMPLOYEES of the Chicago headquarters offices have joined the thoroughly practical movement now under way to beat the high cost of living, especially that particular of existence which requires folks to wear clothes. Permission has been secured to allow employees in the general manager's department to wear khaki shirts and trousers. The women members of the staff may wear khaki skirts. Two worth while advantages will follow the innovation: Everyone will feel comfortable in the regulation duds, and the difference between income and expenses will become more satisfactory. The committee organized to carry out the plan consists of H. F. Kline, assistant cashier in General Manager Cronkhite's office, and Messrs. F. W. Ohley, M. F. Strider, H. M. Correll and B. M. Allen.

GEORGE A. MASON, of the general manager's staff, is a literary genius of recognized ability. He is a writer of excellent verse and has many really clever poems to his credit. On occasions he applies the cunning of his pen in the interests of mundane affairs. Recently he was asked by Secretary Kline of the Fellowship Club to write a letter to the members of the club, asking for a remittance of dues. The letter took the form of a three-verse poem which hit the mark exactly and brought in the money.

THE WESTERN UNION POST OF THE AMERICAN LEGION gave a dance at the Masonic Temple drill hall, Chicago, on April 29, at which there was a large and enthusiastic attendance. There are now more than one hundred ex-fighters on the rolls, and additional members are joining daily. T. F. Moran is commander; J. M. Long, vice-commander; G. V. Hack, adjutant; J. M. Armstrong, finance officer; and T. F. Meighen, sergeant at arms.

IN THE LAKE DIVISION, delivery service at many offices is being improved materially, due to renewed interest in the importance of prompt service. Good work is reported from many offices. Employees who have attracted the attention of the officers at

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division headquarters on account of good judgment exercised in effecting delivery of telegrams recently received, with obscure addresses are: Miss Sherrer, at Coshocton, Ohio; Night Manager Haberstroh, Milwaukee, Wis.; Manager Brown, at Hartford City, Ind.; and delivery clerks Menclewski, Grand Rapids, Mich., Phelan, Stoeckel and Schneider, Cincinnati, Ohio, Eckley, Detroit, Mich., Phelan, Cleveland, Ohio, McFadden and Keller, Battle Creek, Mich., Blair, Port Huron, Mich., Krause and Edwards, Saginaw, Mich., and Cohen, Dayton, Ohio.

Detroit, Mich., Western Union.

MISS ELSIE SHULTZ, stenographer in the superintendent's office, is away on a sick leave.

F. B. BRADLEY, D.C.M., has returned to the service after a two months' illness.

MISS DOSS has been promoted to a position in the cashier's office. She has been manager of a branch office.

MANAGERS RECENTLY APPOINTED: H. J. Myers, Cadillac, Mich.; J. H. Cline, Hammond, Ind.; J. E. Riley, Bloomington, Ind.; C. H. Sly, East Chicago, Ind.; B. F. Boosinger, Grand Haven, Mich.; Cleta M. Bridges, North Manchester, Ind., and W. A. Coleman, Marshall, Mich.

IN A RECENT popularity contest, conducted by the employees of the Columbus, Ohio, office, first place was won by Miss Anna Hannon; second, Esther Price; third, Helene Mitchell; and fourth, Miss J. C. Hull. Votes sold for one cent each, and the contest netted the sum of $250, which has been turned over to the employees' ball team for the purchase of supplies. E. W. Grob, city superintendent, took part in counting the votes and in awarding the prizes.

Cincinnati, Ohio, Western Union.

THE BUILDING in which was located the Ashtabula, Ohio, office, was destroyed by fire on April 3. By prompt and energetic action Manager Goodrich saved the furniture and equipment of the office, and within a few hours after the fire started, had established a temporary office across the street.

DURING THE WEEK of April 19-23 a series of meetings was held in Cincinnati, dealing with Service Sales. A. C. Kaufman, general commercial agent, New York, presided, and the meetings were attended by managers and other employees from this district.

MANAGERS RECENTLY APPOINTED: C. H. Towns, Steubenville, Ohio; Anna May Minor, Cadiz, Ohio, F. D. Coyer, New Philadelphia, Ohio, and Susie Fitzpatrick, North Baltimore, Ohio.

H. M. SCHWAB, after fifty years' continuous service with the company, retired May 1. He entered the service as a messenger boy when he w ten years of age, and at the time of his retireme was manager of the important office in the commi sion district.

NEW CLASS ONE offices have been opened at R venna, Sebring and Franklin, Ohio. The manage in charge, respectively: E. F. Caris, H. E. Cre son, and F. H. Jung.

FRANCIS N. WHITNEY and F. J. McClain, of Ne York, were recent visitors in Cincinnati.

Mountain Division.

The official roster of the Mountain Divisio headquarters at Denver, Colo., is made up of A. Cowan, general manager; C. H. Finley, divisi traffic superintendent; W. C. Titley, division pla superintendent; R. Van Tine, division auditor; B. Colby, division traffic engineer; S. W. Atki son and C. F. Coit, division traffic supervisors.

Flowers by Telegraph.

The custom of "telegraphing" flowers, begu four or five years ago, has grown so that today considerable amount of telegraph traffic is handl in connection with this service.

At the Milwaukee, Wis., office of the Weste Union Telegraph Company, the large front windo space of the main office was decorated by Mi waukee florists as an advertisement of the servi rendered jointly by the flower merchants and t telegraph company.

The display attracted wide attention, and F. Travis, city superintendent for the Western Uni Company at Milwaukee, in a report on the subje says:

"If 'a thing of beauty is a joy forever,' the ma nificent floral display in the Milwaukee main offi lobby windows is in truth a joy. But, alas! it w not last forever. On Sunday last the nine loc florists who compose the Flowers Telegraph Deli ery Association, laid the base of moss on the bul heads, backed by privet, Japanese maple, red beec cedar, asparagus, spirea and ferns. Vases a baskets of the most beautiful American Beauti and Russell roses, and snap dragons, gladioli, tulip larkspur, sweet peas, calla lilies, hydrangeas a carnations entirely filled the five great plate gla windows. Running through the bower of flowe is a pole line (23 poles) spanned by four copp wires stretching from New York to San Francisc with a cut-in at Milwaukee. This feature of t display is of the 'live wire' variety, the copper wir carrying the current that feeds the instrumen (which are mounted on pedestals), being in tur connected to a local wire in the operating room o the fifteenth floor.

"The Flowers Telegraph Delivery Associati put in the display to advertise the sending of flo ers by wire, and a young lady attendant in cha of the flowers has answered inquiries concerni

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the procedure to be followed by any one desiring to send flowers to points throughout the United States and Canada.

"This floral display was decided upon to stimulate patronage and give a more efficient floral service to the public on 'Mothers's Day,' when many people 'Say it with flowers.' Beautiful sentiment is expressed in the telegrams placed among the flowers. One of them reads: 'Mother, today we send you flowers in token of our lifelong love. We choose them for their beauty and fragrance, emblematic of your gracious and tender care.'

"The magnificent spectacle has brought to our windows a constant line of people every minute of the day, and flattering comments are heard on all sides."

SOME MONTHS SINCE, a young soldier returned from overseas and stationed at Roanoke, Va., wired a bank at Sullivan, Ind., where he knew his father had an account, for $100, signing his father's name to the message. The father was out of the city, and the bank wired the money. A week later, the father still being absent, the son wired for $200, and the bank also wired that. When the bank's report reached the father, he notified them he had made no requests for funds, whereupon the bank brought the matter to the attention of the Western Union, which had handled both messages and transfers. Investigation developed the facts, resulted in the arrest of the son and, on May 26, pleading guilty to the charge of forgery, he was given an indeterminate sentence of from one to twenty years in the Mansfield Reformatory.

The successful prosecution of these persons who use the money transfer service to defraud, is proving an efficient deterrent to those who might be tempted, and the company is bending every effort to bring all offenders to justice.

If You Were Delivery Clerk, What Would You Do?

If you were the delivery clerk and had for delivery on Saturday evening a telegram addressed to a business man in your town, and had been unable to locate him either by messenger or by telephone, what would you do about it?

Yes, you would read the text of the message to see what it was about! That's quite right; but suppose the message read: "Reserve room for me at the ——— Hotel, arriving nine in morning," what would you do then?

Joseph Harmet, of the Chicago office of the Western Union Telegraph Company had a case of this sort to deal with recently, and he promptly telephoned the hotel requesting them to reserve the room. This was good figuring. Both the sender and the addressee of the message were pleased with the service rendered.

POSTAL TELEGRAPH-CABLE COMPANY.

CLARENCE H. MACKAY, president, sailed for Europe on the Lapland, May 8, in connection with company interests and inspection of plant.

ISAAC SMITH, superintendent of tariffs, and his staff are now located in new quarters on the seventh floor. The change was necessary by reason of the growth of the department.

D. H. GAGE, division engineer, eastern division, within the past few weeks has visited offices at Atlantic City, N. J., Danbury, Conn., and Harrisburg, Pa.

R. GOULD, of the Plant Department, has returned from Richmond, Va., and Petersburg, Va., where he has been making an inspection of lines and equipment.

P. L. LEE, manager, Milwaukee, Wis., recently made an address before the Rotary Club of that place, on the history and development of the Postal Telegraph Company.

MINOR M. DAVIS, for many years chief engineer, Postal Telegraph-Cable Company, New York, and recently retired, is spending the spring months at his place at North Chatham, Mass.

MANAGERS APPOINTED: I. Rice, New Britain, Conn.; M. Young, Gallup, N. M.; S. B. Winebrinner, Muncie, Ind.; S. Wiltfong, Goshen, Ind.; G. Anderson, Wilmerding, Pa.; Gladys McCord, Michigan City, Ind.; M. Hewitt, New Bern, N. C.; J. E. Johnson, Raleigh, N. C.; C. S. Hudson, Auburn, N. Y.; Walter Emert, Ypsilanti, Mich.; K. H. Knoles, Vandalia, Ills.; J. H. Collins, Waynesboro, Ga.; M. J. Merrimon, Orangeburg, S. C.; A. M. Livingston, Tuscaloosa, Ala.; Mary Henderson, Alton, Ills, and I. E. Burke, Charlotte, Mich.

New York Main Office.

CONGRATULATIONS are in order to Frank O'Keefe, southern wire chief, who reports the arrival of a ten pound boy.

The following chief operators are now taking vacations: T. P. Brooks, J. J. Finnerty, of the day force, and L. A. Boone and A. J. Motto of the night force.

H. D. TURNER, Morse operator in this office, during the month of March handled 23,038 telegrams in 312 hours, an average of seventy-three messages per hour, without any direct or implied errors being charged against his performance. We do not remember seeing record of any previous one month's service performance which equals this.

New York City Notes.

L. P. COLE, manager of Washington market office, and for 35 years connected with this company, is seriously ill at his home.

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PHILLIP REBECCA, manager of the Fourth Avenue branch, has returned to his office after spending two weeks at New Britain, Conn., where he reorganized the methods of accounting and general office methods.

HUGO WEISE, of the sugar district office, who recently underwent an operation on one of his eyes, is back at his post. He has fully recovered.

MRS. FAULKNER, night manager of the Hotel Plaza office, was married on May 8. She will make her home in Holyoke, Mass.

"DA" office formerly at 702 Washington Street, is now located in new quarters at the corner of Hudson and West 10th Streets.

"CX" office formerly at 16 Beaver Street, is now located in new quarters at No. 2 Beaver Street. Manager Cochrane reports business greatly increased.

Philadelphia, Pa., Postal.

C. E. BAGLEY, superintendent, has returned from an inspection trip covering offices in northwestern Pennsylvania.

WM. DELAIR has been appointed cable foreman, third district, with headquarters at Philadelphia.

AT THE ANNUAL RELAY RACE MEET of the University of Pennsylvania, held at Franklin Field, Philadelphia, April 30 and May 1, and which was given an international character by the presence of the Oxford-Cambridge team, the press was looked after by W. G. Kurtz (in charge) H. Riskie, M. Frankel, H. Sweeney, H. I. Gilbert, A. Brailove and M. A. Auerbach. Office electrician A. G. Carpenter was in charge of the composite telephone circuits during the game, which arrangement added to the speedy manner that the news was handled.

T. P. SHERWOOD has been appointed manager at the *Evening Public Ledger* office, succeeding U. G. Nye, who has resigned and will make his future home in Southern California.

L. RENDELMAN has been assigned to the first New York bonus nights.

MISS FREDA MARDER of the main operating department has been transferred to the New York main operating department.

W. T. CORKELL is now assigned in the coffee and cotton district, 102 South Front Street.

R. W. TREUT and HOWARD PRICE, of the cable department, have returned from McCalls Ferry after making extensive cable repairs.

MANAGER C. W. HARMAN of Hagerstown, Md., was a recent visitor.

J. P. MC CLOSKEY has been appointed manager at Salisbury, Md.

CYRUS MOFFET, of Philadelphia, is on furlough recuperating his health. He is spending the time at Westchester, Penna. W. J. Burt is manager at Westchester for the Postal Company.

AT ITHACA, N. Y., the office has been moved to new quarters. Manager G. K. Parr is doing an excellent business.

AT AUBURN, N. Y., C. S. Hudson, operator, has been promoted to the position of manager. George Payne succeeds him as operator.

AT ROCHESTER, N. Y., E. Louise White, chief bookkeeper, has been advanced to the position of cashier. M. C. Megerle, becomes chief bookkeeper; A. P. Voecks, ledger clerk, and Marion G. Fladd, telephone operator.

Albany, N. Y., Postal.

ALDEN ROBERTS, for eighteen years manager at Hudson Falls, N. Y., has resigned to accept a position with the Union Bag and Paper Co.

N. C. PANGBURN, district foreman, has completed the installation of an underground system at Saratoga Springs, N. Y., doing away with pole lines through the city streets.

CHARLES GENDRON, chief operator at Plattsburg, N. Y., is on a month's leave of absence, touring in his automobile.

ANNA T. MONTGOMERY has resumed the managership of the office at Malone, N. Y., after a six months' leave.

Chicago Postal.

AT FON DU LAC, WIS., the company's office has been established in new and up-to-date quarters. Manager Charbonneau is now well located to do business on a large scale.

THE APPLETON, WIS., office has been moved to a new location, and Miss. Kaestle, manager in that city, is rendering excellent service to the public.

J. E. PARKE has been appointed manager of the office at Keokuk, Ia., vice Mr. Hebblethwaite, who has taken a position as operator in his home town, Racine, Wis.

MANAGER ROBERTS, at Rockford, Ills., reports that his new office in the Nelson Hotel building has been completed. New equipment and furniture was installed, making the office one of the most attractive in the state.

Communication With Germany.

It was announcd on April 28 that the French Government has removed all restrictions on communication between France and all points in Germany. This refers to territory in the "occupied" district as well as to Germany proper.

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New York Central Conference.

A conference of telegraph and telephone officials of the New York Central Railroad was held in the offices of E. C. Keenan, general superintendent of telegraph, New York, on May 6 and 7. Those in attendance included R. F. Finley, Cleveland, Ohio; J. J. Ross, Detroit, Mich; B. J. Schwendt, Columbus, Ohio; S. L. Van Akin, A. B. Taylor, and Stanley Rhoads, New York.

The Proposed Telegraph Tournament—Philadelphia Telegraphers Alive.

In the *Bulletin* of the Dot and Dash Club of Philadelphia, Pa., for the month of May, appears the following:

"MORSE TOURNAMENT.

"From the TELEGRAPH AND TELEPHONE AGE we learn that a proposed telegraph tournament is being enthusiastically discussed among telegraphers in the large centers in the East. This is of particular interest to the Dot and Dash Club, because Philadelphia is sure to be well represented among the winners, whether it be in sending, receiving, press work, broker work or railroad work. A few names that instantly occur to us are Harvey Williams, Harry Emanuel, R. C. Bartley, Jimmy Harrison, and men of their class. There are many others who would be brought into the limelight by a tournament today.

"WHAT DO YOU KNOW?

"1. Who's the fastest operator at the W. U.?
"2. At the Postal?
"3. At the Reading Terminal?
"4. At Broad Street Station?
"5. Who is the oldest operator in Philadelphia?
"6. The youngest?
"7. Who still works a typewriter with two fingers?

"NOTE.—Send answers to the Editor, care Postal.

"Wonder what kind of showing the 'stars' of early days would make against the stars of today. We would like to see a team composed of Eddie Price, Lieberman, Riskie, Kurtz, Prettyman, Bernstein, McLaughlin and Riley pitted against any sixteen old-timers for a contest."

Philadelphia telegraphers have, in previous fast sending tournaments, made an enviable showing, and it is expected that in the tournament proposed for the near future, Chief Operator Earl Miller's Morse stars will be listed in all events.

IN BUENOS AIRES, South America, a company has obtained a concession to establish an automatic telephone system in the national capital. Material for the installation has been ordered from the United States.

OBITUARY.

Death of J. Q. Mason.

J. Q. Mason, for many years assistant superintendent of telegraph of the Northern Pacific Railroad at Tacoma, Wash., died at Tacoma, on April 27.

Born at Goodings Grove, Ill., about 50 miles from Chicago, August 24, 1842, Mr. Mason early became a telegraph operator. He enlisted in the Chicago Mercantile Battery of Artillery at the outbreak of the Civil War, and was in the battles of Fort Donelson and in General Sherman's first attack on Vicksburg. Taken ill with typhoid fever, he was ill for some time, and on his discharge from the hospital he was drafted into the military telegraph service, remaining until the close of the war. After the war he returned to the telegraph service in Chicago, and became chief dispatcher for the Wabash line at Moberly, Mo., and at Peoria, Ill. In 1888 he became assistant superintendent for the Northern Pacific Railway at Tacoma.

From 1895 until the time of his death Mr. Mason was inspector of cross-arms for the Western Union Telegraph Company.

He is survived by his wife and three sons.

International Telegraph Convention.

There are 49 countries represented in the list of adherents to the Telegraph Convention. Of telegraph companies, there are 18 which adhere, 15 which, though not official adherents, conform generally to the regulations, and correspond regularly with the Bureau, and five companies which generally only correspond with the Bureau through companies in the other groups. The 49 countries represent an area of 73,261,282 sq. miles, and a population of 1,114,866,650.

IN BOLIVIA, South America, a new telegraph line has been opened between Colcha, capital of the province of North Lipez, and Julaca, a town on the Antofogasta and Bolivian Railway.

OPPORTUNITY

An old established company near New York requires the services of a young man with special knowledge in detail design of telephone transmitters and receivers to be applied in the development of a new field. Answers should cover the questions of salary, experience, description of original work (if any), and when position could be accepted.

Address PERMANENT, Box 200, Telegraph and Telephone Age, 253 Broadway, New York.

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BOOKS ON
ELECTRIC COMMUNICATION

Books which are having the largest sales, and which we can recommend to students of telegraphy, telephony, and radio telegraphy, are the following:

AMERICAN TELEGRAPH PRACTICE. By Donald McNicol.

This standard work on land line Morse telegraphy has 502 pages and 421 illustrations. It was written for operating department employees who desire to become proficient in the handling of duplex and quadruplex apparatus, repeaters, and in wire testing.

The price is $5.00 per copy.

POCKET EDITION OF DIAGRAMS. By Willis H. Jones.

This pocket-size book has had a large sale to students of telegraphy. The text matter is simple and understandable. It contains 465 pages of text and 235 diagrams; in addition to which there is a 22 page supplement with 16 diagrams describing the Western Union multiplex printer.

Price, $2.50 per copy.

TELEPHONOLOGY. By H. R. Van Deventer.

This big work contains 586 pages of text matter and 682 diagrams, completely describing and illustrating telephone systems and apparatus. More than 40,000 copies of this book have been sold.

Price, $4.00 per copy.

ELEMENTS OF RADIO TELEGRAPHY. By Ellery W. Stone.

This new work on radio signaling contains 400 pages and 158 illustrations. It is an excellent book for the up-to-date amateur and for the radio operator.

Price, $3.00 per copy.

RADIO ENGINEERING PRINCIPLES. By Lauer and Brown.

This is a 1920 book containing 295 pages of text matter and 253 diagrams and plates. It is the latest work published dealing with vacuum tubes, amplifiers, and other late radio improvements. It is an excellent book for the student and the engineer.

Price, $4.00 per copy.

From TELEGRAPH AND TELEPHONE AGE

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Telegraph and Telephone Age

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Consolidation of Telegraph and Signal Departments of Large Railroads.

The merging, on the Pennsylvania Railroad System, of the management of the telegraph and telephone department, and the management of the track signaling department, marks a step which may prove to be either in the right or the wrong direction.

On comparatively small and relatively unimportant railroad systems communication facilities and track signaling facilities have for many years been in charge of a single operating head, but the experiment which the Pennsylvania Company is making is the first large-scale attempt, in this country, looking to a consolidation of the two departments. And the practical working out of the idea will be watched with a great deal of interest by railroad executives and by telegraph and signal officials the country over.

Radical changes in systems of management, if they are to accomplish both improvement of operation, and economies, require that the changes be well conceived, thoroughly believed in by those who are to direct the detail work, and that a predetermined, liberal period of time be allowed for the development of the scheme before stock is taken as to whether or not the general idea is right or wrong.

The Pennsylvania Company has made a good beginning by selecting for the various official posts men of long experience, excellent training, and individually of high character. Certainly this is the correct first step.

In announcing the consolidation an official of the company said: "It is believed that economies and increased efficiency will be effected by the consolidation—especially in the maintenance of the systems—as it is the intention that eventually maintainers and inspectors will become proficient in maintaining and adjusting the various track signaling devices, telegraph, telephone, and selector equipment, also the automatic and manual telephone switchboards, many of which are owned by, and the majority of which are maintained by the railroad company.

"Without doubt, the maintainers who are able to locate and clear trouble in signal, telephone or telegraph apparatus will be able, with little instruction, to maintain the apparatus of all of these systems.

"In making new installations of telegraph, telephone, and signal apparatus—as at a tower—the organization will overcome certain difficulties which have previously existed, by the proper assignment of space for each part of a given installation. Through this coordination plans can be developed for an economical and efficient arrangement.

"The fundamental principles governing the operation of all of this equipment are essentially the same; but there are, of course, radically different applications in the design and construction of the apparatus, current values, and line conditions required in their operation.

"One maintainer covering a given district eventually will be able to look after the equipment and lines for both systems. It has been the practice in the past for the telegraph and telephone department to erect and maintain the signal wires on the telegraph poles, so there will be no change in this respect. The maintainers will probably become familiar with both types of apparatus on account of their closer association with the different devices and because of their responsibility."

In an early future issue of TELEGRAPH AND TELEPHONE AGE it is intended to present the views of a number of railroad telegraph and telephone officials in regard to the advisability of combining track signaling and wire communication departments.

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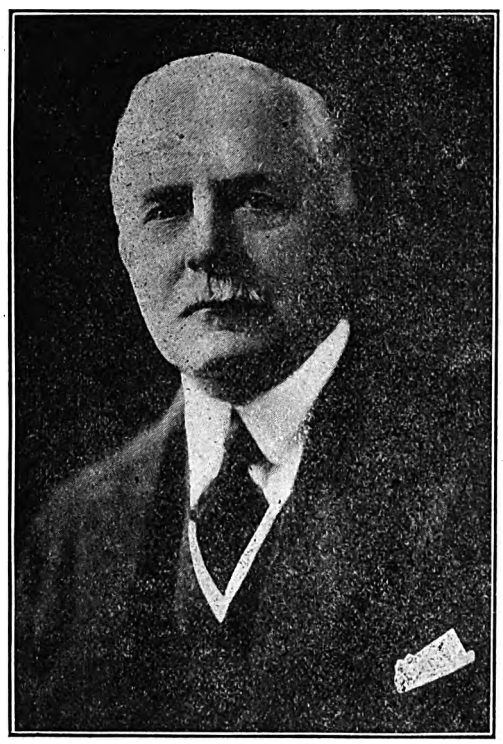
NEW ORGANIZATION OF THE TELEGRAPH, TELEPHONE AND SIGNAL DEPARTMENTS OF THE PENNSYLVANIA SYSTEM

The new organization of the telegraph, telephone and signal departments of the Pennsylvania Railroad, as mentioned briefly in our issue of April 1. will effect appreciable changes in these respective departments in the way of planning, installing and maintenance, but the changes will be made gradually as the men become familiar with the circuits and apparatus.



C. M. SHEAFFER.

As this is the first instance in the United States where the various departments of communication and track signaling have been consolidated on a large trunk railroad system, the working out of the idea will be closely observed by the executives of other railroad systems. Much, therefore, depends upon the individual ability and resource of the officials and engineers who will have charge of this first large-scale undertaking in consolidating these departments.

The photographic reproductions and personal sketches which follow are of the men who make up the personnel of the Pennsylvania system's new communication and signal staff.

Mr. Sheaffer, chief of transportation of the Pennsylvania system, has served twenty-five years in the operating and executive forces in the telegraph department, out of a total of forty-three years' service with the company. From his experience as a telegraph operator, train dispatcher division operator, and superintendent of telegraph Mr. Sheaffer is in a position to appreciate the importance of adequate and reliable communication as an essential part of the whole transportation system. His intimate knowledge of train movements which are controlled by the communication systems has been of value to him in the handling of the larger transportation problems for which he has been and now is responsible.

He entered the service as a messenger boy in Pittsburg, in 1877, where by earnest effort he became a telegraph operator the following year; then train dispatcher and division operator on the Pittsburg Division in 1885. In 1901 he was made superintendent of telegraph of lines east at Philadelphia, being promoted to superintendent of passenger transportation in 1903, and general superintendent of passenger transportation in 1911. In April, 1917, he was called to Washington by the Executive Committee of the American Railroad

GEORGE A. CELLAR.

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Association in connection with car service efficiency as an essential element of success of national transportation, and subsequently was appointed chairman of the Commission on Car Service, which position, in connection with his duties with the Pennsylvania Railroad, he held until the early part of February, 1918. On March 1, 1920, he was made chief of transportation, having general supervision over the freight and passenger business of the entire system.

George A. Cellar was appointed on March 1, 1920, general superintendent of telegraph for the system, with headquarters at Philadelphia, Pa., reporting to C. M. Sheaffer, chief of transportation. He was born September 12, 1860, in Delaware County, Ohio, and was educated in private and public schools.

In 1877 he entered the service of the company on the Fort Wayne Division, and served as clerk, telegraph operator and relief agent until 1884, when he was made manager and wire chief; then chief clerk to the superintendent of telegraph, in 1885, and superintendent of telegraph of the Western lines at Pittsburg, Pa., in 1904, which position he held until his recent appointment.

I. C. Forshee was appointed on March 1, 1920, electrical engineer, located at Philadelphia, and reports to G. A. Cellar, general superintendent of telegraph. He was born in Willet, N. Y., August 21, 1880; educated at Cornell University, graduating in electrical engineering with degree M.E., in 1905.

He served as student apprentice with the Western Electric Company, New York, in 1905, and later in the telephone switchoard, engineering and sales departments at New York and Pittsburg.

In December, 1911, he entered the service of the Pennsylvania Railroad, Eastern lines, as electrical engineer in the office of the superintendent of telegraph at Philadelphia, which position he held until his recent appointment.

Jacob Bright was appointed on March 1, 1920, chief clerk to the general superintendent of telegraph at Philadelphia.

He was born January 23, 1888; educated at Lehigh University, graduating in electrical engineering in 1910.

He entered the service of the Pennsylvania Railroad, Eastern lines, July 1, 1910, as a signal apprentice; appointed assistant inspector of signals in the general office, Philadelphia, July, 1913; assistant supervisor of signals on the Trenton Division, January, 1914; assistant supervisor of signals, Pittsburg Division, October, 1914; assistant division operator, Pittsburg Division, February, 1916, and division operator, Allegheny Division, at Oil City, November, 1917, which position he held until his recent appointment.

A. H. Rudd was appointed on March 1, 1920, chief signal engineer of the Pennsylvania system, located at Philadelphia, and reports to A. C. Shand, chief engineer. He was born at Lakeville, Conn., March 8, 1867; educated at Sheffield Scientific School, Yale University, graduating in 1886 with the degree of Ph.B.

JACOB BRIGHT.

In Novebmer, 1886, he entered the service of the Pennsylvania Railroad as draftsman in the real estate department; March, 1888, he was made draftsman in the signal department.

He later severed his connection with the Pennsylvania Railroad, and on March 1, 1892, was made inspector of signals on the New York Central and Hudson River Railroad, being promoted on May 1, 1892, to signal engineer, and on May 1, 1893, to assistant superintendent of signals, Hudson Division.

On August 15, 1894, he went with the New York, New Haven and Hartford Railroad as foreman, electric signals, Hartford Division, and was later promoted to the position of signal engineer of the Hartford and Valley Divisions.

April 1, 1900, he was made signal engineer of the Delaware, Lackawanna and Western Railroad.

He returned to the Pennsylvania Railroad on March 1, 1903, as assistant signal engineer and was made signal engineer August 1, 1907, where he remained until his recent appointment.

J. D. Jones was appointed on March 1, 1920, superintendent of telegraph and signals of the Eastern region, and reports to the general manager, Philadelphia. He was born at Richmond, Va., August 23, 1883; educated at Richmond College, Va., receiving degeee of B.S. in 1903; later taking up the

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electrical engineering course at Virginia Polytechnic Institute, receiving B.S. degree in electrical engineering in June, 1905.

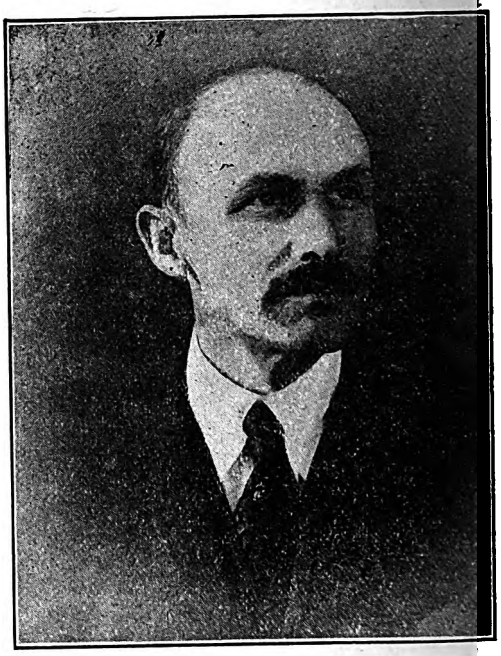
He entered the service of the Western Electric Company, New York, as a student apprentice in August, 1905; was transferred to the engineering department, New York, July, 1906, handling work on central office equipment. One year later he was transferred to the Hawthorne plant, continuing his work in the engineering department Early in 1909 he was assigned to their Philadelphia branch house, where he was engaged in the engineering sales department.

J. D. JONES.

In March, 1910, he entered the service of the Pennsylvania Railroad Company as electrical engineer in the office of superintendent of telegraph at Philadelphia, Pa.; was transferred to Pittsburg Division as assistant division operator, 1911; promoted to division operator, Williamsport Division, January 16, 1916.

In November, 1917, he was furloughed to enter military service, and was commissioned as captain, Signal Corps, U. S. A., being assigned to the 413th Telegraph Battalion in command of Company D. He sailed for France with the A. E. F. January 9, 1918, and was assigned to duty in the office of the chif signal officer, A. E. F., Tours, France, April 1, 1918, handling engineering work for telegraph and telephone lines of communication on heavy and light railroads. He was assigned to duty with the Transportation Corps from January 1, 1919, to February 14, 1919, when he was promoted to grade of major, signal corps, and served as general superintendent of telegraph of Transportation Corps in the Service of Supply, A. E. F., April, 1919, to July, 1919.

In August, 1919, he returned from furlough and resumed his duties as division operator, Williamsport Division, Pennsylvania Railroad, where he remained until his recent appointment.



W. N. SPANGLER.

W. N. Spangler was appointed on March 1, 1920, assistant superintendent of telegraph and signals, Eastern region, Philadelphia. He was born at Jennerstown, Pa., August 6, 1877; educated in the public schools and the Central State Normal School at Lock Haven, Pa.

He entered the service of the Pennsylvania Railroad at Altoona, Pa., as leverman, in September, 1900; transferred to the signal department as signal laborer and later as signal maintainer, March, 1901; signal foreman in December, 1902; assistant supervisor of signals, Middle Division, November, 1905; Southern Railroad, February 1, 1906; on January 15, 1909, he was furloughed to take up signal work for the Pennsylvania Tunnel and Terminal Co., New York. He returned on January 1, 1912, and was made inspector of signals in the signal engineer's office at Philadelphia; assistant signal engineer for the Pennsylvania Railroad on March 16, 1918, which position he held until his recent advancement.

W. M. Post was appointed on March 1, 1920, as superintendent of telegraph and signals, Central region, and reports to the general manager, Pittsburg, Pa. He was born at Andover, Conn., July 10, 1876; educated in private and public schools.

He entered the service of the New York, New Haven and Hartford Railroad in the construction force of the signal department, in 1896; made

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batteryman and maintainer in 1897; division signal foreman in 1900.

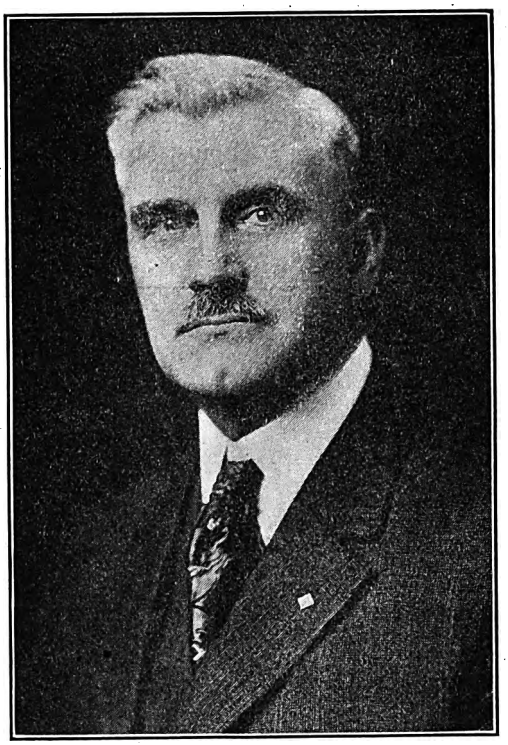
In 1905 he resigned from the New Haven to accept position as circuit draftsman in the office of the signal engineer, Pennsylvania Railroad, Philadelphia; was made assistant supervisor of signals, West Jersey and Southern Railroad, February, 1906; assistant supervisor of signals, Pittsburg Division, December, 1906; supervisor of signals, Chautauqua division, February, 1909; supervisor of signals, New York Division, July, 1909; inspector signals, Eastern lines, Philadelphia, July, 1916; signal engineer, January, 1917; assistant superintendent, Middle Division, February, 1918; assistant superintendent, Pittsburg Division, September, 1918, which position he held until his recent promotion.

W. M. Post.

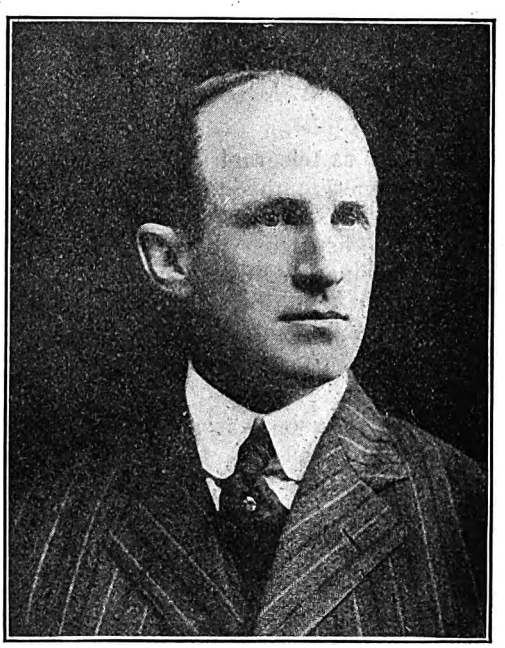
L. Behner was appointed March 1, 1920, assistant superintendent of telegraph and signals, Central region, Pittsburg, Pa. He was born December 23, 1869, Columbiana County, Ohio, and was educated in the public schools.

He was employed as telegraph operator on the Cleveland and Pittsburg Railroad in 1887; was transferred as telegraph operator to the general office, Pittsburg, Pa., in 1898; assistant chief operator in the main office, Pittsburg, in 1901; chief clerk to the superintendent of telegraph, Pennsylvania lines, in February, 1904; telegraph and telephone engineer, Pennsylvania lines, on July 1, 1919, which position he held until his recent promotion.

E. B. Pry was appointed on March 1, 1920, superintendent of telegraph and signals, Southwestern region, and reports to the general manager, St. Louis, Mo. He was born January 12, 1872, at Burgettstown, Pa.; educated in the public schools of that place and Washington, Pa.



L. Behner.



E. B. Pry.

On December 12, 1894, he entered the service of the P. C. C. and St. Louis Railway Company as signal maintainer; was made division electric signal foreman in February, 1900; transferred to the

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G. R. & I. Railway as signal supervisor, with headquarters at Grand Rapids, Mich., on February 1, 1903; and on January 1, 1905, he was transferred to the office of the signal engineer, Pennsylvania lines west, Pittsburg, Pa., as signal inspector, which position he held until his recent advancement.

E. M. Pence was appointed on March 18, 1920. assistant superintendent of telegraph and signals, Southwestern region, St. Louis, Mo. He was born at St. Paris, Ohio, May 7, 1870; educated in the public schools.

He entered the service of the P. C. C. and St.

E. M. PENCE.

Louis Railway as telegraph operator in July, 1887; was made copier in the dispatcher's office, Xenia, Ohio, August, 1893; dispatcher, April, 1898; was transferred as dispatcher to the C. L and N. Railroad at Cincinnati, Ohio, November, 1900; appointed division operator, Cincinnati division, Cincinnati, Ohio, on October 1, 1908, which position he held until his recent promotion.

Clement W. Hixson was appointed on March 1, 1920, superintendent of telegraph and signals, Northwest region, and reports to the general manager, Chicago, Ill. He was born in Mt. Carmel, Ill., June, 1882; educated at Purdue University in electrical engineering, including cadet service, graduating in 1905.

He entered the service of the Pennsylvania Railroad, Western lines, as special apprentice, Pittsburg, Pa., in 1905; signal foreman, April, 1907; signal inspector, 1910; supervisor of signals, Terre Haute, Ind., March, 1914; supervisor of signals, Chicago, Ill., November, 1915, which position he held until his recent promotion.

Oliver L. McCreary was appointed on March 1, 1920, assistant superintendent of telegraph and signals of the Northwestern region, Chicago, Ill. He was born in Wellsville, Ohio, October 23, 1872; educated in high school and Ohio State University.

He was first employed on the railroad as a messenger and clerk at Wellsville, Ohio, but resigned to take up his studies at Ohio State University. In 1898 he re-entered the service of the company under the division engineer at New Castle, Pa.; was transferred to the office of the superintendent of telegraph, Pittsburg, in 1900.

In 1918 he entered the service of the United States Railroad Administration at Washington, being promoted to assistant to the manager of the telegraph section, and held this position until his recent appointment.

American Legion, Signal Post No. 343.

At its regular monthly meeting on April 30, 1920, Signal Post No. 343 of the American Legion by a unanimous vote of its members present decided to extend its membership to include the female enlisted personnel who served with the telephone units of the Signal Corps, U. S. A., during the World War.

This Post was formed in the Fall of 1919 of former members of the 102nd Field Signal Battalion, 27th Div., U. S. A., and ex-officers and men of the Signal Corps as the nucleus. It now includes in its membership many telephone and telegraph officers and soldiers who served with the Signal Corps both at home and abroad during the war and should extend its membership to the girls of the Signal Corps' telephone units.

It is desired that this news be disseminated so that all of the female personnel of the Signal Corps in this vicinity receive this information and the Post invites all honorably discharged female personnel of the Signal Corps, eligible to the American Legion, to join its membership.

Enrollment cards may be obtained by applying to the Secretary, Signal Post No. 343, The American Legion, 100 E. 34th St., New York City.

In this connection it is also desired that all telephone and telegraph officers and soldiers who are eligible to The American Legion, join this Post as it is desired to make this Post the one Signal Corps Post to include all of the telegraph and telephone officers and soldiers who served in the great war, including those who served in the Navy and other branches of the Army, but who now are in civilian life connected with the telegraph and telephone companies.

Frank H. Fay, major, Signal Officers' Reserve Corps, is actively engaged in perfecting the organization.

IN THE YEAR 1854 platinum of the best grade sold for $8 per ounce.

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WASTE NOT!

By F. E. d'Humy.

Are you wasteful? I will answer for you. Yes; we all are, more or less.

What does waste mean? It means that you are contributing to deprive yourself and all your fellow beings of greater comforts and are retarding progress toward a higher plane of living and thinking.

The channels through which waste occurs are innumerable. The employer, the manager, foreman, supervisor; in fact, anybody directing the work of others, is wasteful unless the work is directed in a manner to insure maximum output for the time and effort expended, and unless the output contributes directly or indirectly to the well being of mankind. Each and every individual is master of his own time and efforts and is likely to be wasteful thereof unless watchful to be otherwise. If he wishes to avoid waste, as he should, he must be careful in the selection of his daily occupation to see that it is directed in proper channels, and then apply the most intelligent effort at his command in its performance.

Then, there is another kind of waste, of which the majority of us are apt to be more conscious. That is the waste of the products furnished by nature and through the efforts of men.

If we were to eliminate only one-half the waste occurring through negligence and willfulness of the people as a whole, it is not extravagant to predict that every one of us would be placed in the position of enjoying, from the cradle to the grave, a refined and comfortable dwelling, generously equipped; good food and clothing, together with ample, wholesome recreation and sufficient time left for self improvement and rest; more than these will add no benefits or happinness; all of these you are entitled to; all of these you and every other human being can have, if each and every able bodied person will make a conscientious effort to minimize waste. Let each of us begin now by keeping the thought in our minds, and remain ever watchful of opportunities to practice that which will repay us manifoldly.

The travelling man who deliberately permits the electric lights to remain burning in his room when he leaves it, commits a breach of faith with himself and his fellow men. His conscience will trouble him, although he may trick himself into believing it will not. Perhaps he may excuse himself with the thought that the power from which the electricity is produced comes from a waterfall and, therefore, it should be used, in no matter what manner, or it will be wasted. In such case he reasons erroneously. He overlooks the fact that the lamp is wearing out and that it requires labor, material and intricate machinery to make a new one. He overlooks the fact that the electricity used in lighting the lamp creates a stress in the working parts of the hydro-electric power plant which produces wear and tear, contributing thereby to its earlier replacement at expense of labor and materials. Electric transmission lines are difficult and expensive to build. Electricity carried over them, which is wasted instead of being used advantageously, nullifies some portion of the engineering effort, labor and material required to produce them.

If an attempt is made to trace the ramifications of waste, no matter in what form or how small the initial waste may be, they will be found too numerous and complex to follow. The next time you waste some manufactured article, try to list the successive efforts which had been expended to produce and give to you that article. Your list will include so many processes before you even reach those required to secure the raw materials of which the article initially wasted is composed, and the materials in the tools used in the various stages of production, that you will give up the self imposed task; for, to continue, would be extravagant waste of your time. But make the attempt, nevertheless, for it will bring to you a clarified realization of the loss to humanity to which you have been contributing, and if you are the kind of a man you hope you are (the other kind will not read this), you will henceforth exercise greater care in avoiding waste directly or indirectly.

Waste of time deprives humanity of more than does any other form of waste. Therefore, it behooves all of us to improve as much as possible the use we make of this most precious factor. The use we have collectively made of time has given us all we have. It has given us food, clothing, houses, public works, transportation—in fact, everything. Some of us are able to enjoy any of the comforts and pleasures that we may desire and which are afforded by collective effort, while many others are unable to do so because there is insufficient for all. There are many instances where human beings are suffering from lack of the necessaries of civilized life. Much hardship is endured, causing jealousy, discontent or strife. This insufficiency exists because collectively we are delinquent in making good use of our time, and because we are not careful to avoid wasting that which we have expended effort to produce. We are each more or less to blame, but some much more so than others. It is the minority who do the real work of the world, while the majority either make an indifferent effort or no effort at all. Those who contribute nothing and are able bodied may be classed as human parasites. Those who willfully shirk are bordering on

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this class. It behooves anyone entertaining any thought of shirking to think twice of the enormity of the evil with which he is flirting. If an injustice is being suffered, do not try to correct it by shirking; it cannot be counteracted by another injustice, especially one of such malignancy as wastefulness. Other means should and usually can be found which will effect the remedy desired.

The leader who directs workers to limit their output with the erroneous idea that it will provide work for a greater number of those enrolled in the trades to which they belong is willfully wasteful; is an enemy to himself, to those following his dictates and to society. By such means the aggregate production of the world is reduced and the majority of the people, and usually the workers themselves, are indirectly deprived of the comforts that all should enjoy. To restrict the output of labor is therefore a criminal offense against society. All workers and their leaders should become acquainted with the fundamental laws which govern prosperity. Workers should not tolerate for a moment leaders who endeavor to restrict or waste output. They should be careful to select only those representatives who endeavor to bring about an increased output for effort expended, by gaining for them better working conditions, shorter hours, if the latter are too long for efficiency; better wages, if the wages are insufficient to maintain a wholesome body and a wholesome mind, closer and more friendly relations with the employing interests, that a better understanding of the needs of both employee and employer may be gained. Attention toward these ends should always be mutually directed in order that maximum benefits may be obtained for both.

Waste may be practiced in so many ways that it is impossible to enumerate them. It is impracticable to do more than suggest where and when it may be avoided. The best and surest way to minimize it is by the exercise of conscience. If we will each keep in mind the duty we owe ourselves and society in this respect, the many avenues through which we practice waste will reveal themselves one by one, and each of us will find himself gradually approaching a better, broader and more prosperous life and setting an example for others to follow.

Waste not your productive time.

Waste not the productive time of others.

Waste not your recreation and self improvement time.

Waste not your resting time.

Waste not anything given you by God or man.

ACCOUNTING

THE GREAT MYSTERY REVEALED

By L. K. Frank,

General Auditor's Office, New York Telephone Company.

The mystery which surrounds accounting for those not acquainted with the subject is due, in a large measure, to the technical terms and discussions of the subject.

When stripped of these technicalities and of the bookkeeping mechanics, accounting is seen to be a variety of statistics—the orderly and systematic collection of information about financial transactions. When public utility accounting is analyzed, it is found to be a method of recording information of two kinds—how the company spends its money, and where its money comes from.

Regarded in that simple way, it is not difficult to understand telephone accounting, especially when it is noted that the accounts are precise records of actual transactions. So that the business of the accountant is to ascertain precisely what has been done and determine accurately what amount of money has been expended or received, then to record the amount in the account designated for the purpose.

Thus, all the accounts may be divided into two general classes, namely, records of the cash expended according to the purposes sought by the expenditure, and records of the cash received by the company according to the services rendered or purposes for which the cash is obtained.

"Accounting" for Money.

There are six groups in the telephone system of accounts. First come the asset accounts and then the liability accounts, making up the so-called "balance sheet." Then there are the revenue accounts and the expense accounts. And, finally, we have the income accounts and the surplus or deficit accounts.

The asset accounts record the cash of the company or the amount of cash due to the company, as in the various accounts receivable. They also record the amount of cash used for permanent long term purposes, such as the building of plant and equipment (fixed capital), or the purchase of investment securities or various funds set up for future purposes.

The liability accounts record the sources of cash obtained for asset uses; that is, for long term investment. For example, the capital stock account records the amount of cash capital contributed by the stockholders and the funded debt account records the cash furnished by the bondhold-

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ers; in both cases the cash so obtained is for use in building plant, purchasing investment securities, and providing the necessary free cash for running the business. The accounts payable in the liability group are records of the cash cost of services or of materials which the company has received but not yet paid for, while the reserve accounts and corporate surplus accounts record the amount of cash received from subscribers or users of service over and above the costs of operating the business.

Debit and Credit.

The revenue accounts record the amount of cash earned and due to the company for furnishing telephone service. The expense accounts record the cost of operation incurred in earning the revenue.

The income accounts are both a statistical summary of the earnings and expenses and also a record of cash earned and due the company from non-operating transactions (such as interest, rents, dividends) or cash expenditures made or due for taxes, rents, interest on indebtedness, and other items not directly connected with operating expenses.

Finally, the income accounts record the disposition of the net earnings of the company, after all expenses have been deducted which are appropriated as dividends to pay the stockholders for use of their money or as additions to the corporate surplus which is accumulated for emergenies or unusual demands upon the resources of the company.

A seventh group consists of the clearing accounts, which are temporary records of cash used for various purposes, which must be brought together before they can be distributed for record in the appropriate accounts, such as fixed capital or expenses. Examples of clearing accounts are the engineering expense, plant supervision expense, and house service expense.

"Checking Up."

Each of the six groups of accounts includes many individual accounts. That is to say, these records of cash expended or received are divided into many accounts in order to record various cash uses for administrative purposes. The expense accounts, for example, are divided first by departments (plant, traffic, commercial, and executive) and then further divided by classes of work each department performs, so as to record the cost of each significant item of operating work.

The accounting department is not engaged in compiling records by the several accounts for accounting reasons alone, but rather is seeking to record the cash uses and receipts so as to furnish as much administrative information as possible. For that reason the cash used in constructing plant and equipment is recorded in approximately forty separate fixed capital accounts, each of which is maintained in order to furnish the plant and engineering departments with the record of cost of various types of plant and equipment.

Likewise," the operating expense accounts are divided into as many accounts as there are significant factors of operation, so that the several departments can be furnished with these detailed subdivisions of expense for administrative use. Similarly, the revenue accounts are subdivided to record the cash earned by each class of service, so that the commercial department can study the growth of business and the effect of rates on business.

It is an axiom of organization that a man given certain authority is strictly responsible for the exercise of that authority and the accomplishment of the work for which he was given the authority. The accounting department, through its administrative accounting reports, furnishes the records of the cash used and received according to the authority under which the costs or the revenue was incurred or earned. Thereby it becomes a first aid to supervision and a constant witness of the work of every person in the organization.

All, Lend a Hand.

In all this work of recording, the accounting department is dependent upon the other departments which handle the time sheets and payrolls, the contract orders and the toll tickets, the working advance vouchers, the miscellaneous bills and Western Electric bills, and which indicate on these papers the class of work or plant for which the expenditures are made.

Thus every department participates in the accounting and, by its prompt and accurate handling of these many pieces of paper and of the various summaries and reports, makes possible these statistical, accounting records. This tremendous volume of work in the field and division offices and in the plant accountant's office finally results in the records of the general books of the company and in the reports to the American Telephone and Telegraph Company. Also it furnishes the information needed for the various reports to the Interstate Commerce Commission and the several state commissions which are the reports of our stewardship to the public.

The "Recording Angel."

Viewed as an aid to administration, as the "recording angel" who keeps records of how authority is used, of how responsibilities are discharged, it is evident that the accounting department is not a mysterious, dry-as-dust keeper of figures, but rather an essential part of an operating organization. And instead of being the bugbear of the operating departments, to be endured because it can't be avoided, the accounting procedure and records are seen as the living history of the whole organization and of each of its parts, in which not alone is inefficient work exposed, but also effective and economical administration is impartially recorded. So that in the accounts is built up the indisputable record of every person's work in the organization.—*Telephone Review.*

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PRINTING TELEGRAPH SYSTEMS

JOHN H. BELL

Telegraph Engineer, Western Electric Company, New York

(Continued from May 16 issue.)

SYNCHRONISM

Mechanical Correction. As previously stated two types of distributors are used. They differ only in so far as one is provided with a mechanical correcting or synchronizing mechanism which is not present in the other, synchronism in the latter being secured entirely by electrical means. In the case of mechanical correction the correcting impulses are generated by a reversal of current in one direction only, while in the electrical correcting method the correcting impulses are generated by current reversals in both directions.

A schematic diagram of the circuit for mechanical correction is shown in Fig. 34. The distributor motor at the corrected or speed controlled station is arranged to run slightly faster than the motor at the correcting or speed controlling station. If reversals of current in the line signals take place when the brushes which sweep over the correcting rings at the controlled station are on a dead or unconnected segment, as at the point indicated by the arrow marked *X*, no correction takes place. But the brushes at the speed controlled station will gain over those at the speed controlling station so that after one or two revolutions the brushes at the former station will be leading, and be on a "live" segment at the moment when the corrector relay tongue which follows the movements of the line relay, moves to its *M* contact.

Before the "break" relay *B R* has had time to pull up its armature, an impulse passes via the back contact of *B R* to the solid correcting ring, across the brushes, the "live" segment, switch *S* through the correction relay *C R* to the — 110 *V*. The corrector relay is actuated and is locked up due to current from the + 110 *V* flowing via the armature and front contact of *C R* and the back contact and lever on the stepping pawl *P*. A path is also provided from the + 110 through the corrector magnet *C M* which is energized. Actuation of the armature of *C M* causes the pawl *P* to step the ratchet wheel one tooth. As it completes its stroke the pawl lever causes the circuit from the + 110 to be opened so that the corrector relay *C R* and the corrector magnet *C M* are restored to normal. The stepping of the ratchet wheel has the effect of momentarily stopping or retarding the movement of the brushes so that they are again in sufficiently close phase relationship with the incoming signals to insure the correct distribution of the selecting impulses to the printer selecting relays.

The mechanical feature of the correcting device is shown in Fig. 35. The motor shaft carries with it the frame *F* on which is mounted the corrector magnet, the ratchet wheel *A*, gear wheel *B*, the pawl and jockey roller.

A and *B* are fixed on the same spindle and are prevented by the jockey from rotating. Consequently, when the motor shaft is rotated, gear *B* transmits motion to the brush holder shaft in the direction indicated by the arrow marked *N*. When a correcting impulse actuates the corrector magnet, the pawl steps the ratchet wheel *A* one tooth in a counter-clockwise direction, so that *B* advances one tooth around *C* in the direction marked *N*, which is the equivalent of stepping the gear *C* in the direction marked *R*. The resultant effect is that the brush holder shaft is momentarily retarded.

Phase Finding. In order to bring the brushes at the two stations into proper phase relationship, *i. e.* into synchronism, a switch is provided at the speed-controlling station for sending a long negative pulse from sending segments 1 to 19 and a positive pulse from sending segment 20. The switch marked *S*, Fig. 34, at the speed-controlled station is thrown to the right, disconnecting all the "live" segments but one. Consequently, only one correcting pulse will be generated per revolution of the brushes and it will be inoperative until the brushes at the corrected station overtake the incoming signals, at the position marked *X*.

Electrical Correction. Fig. 36 shows in schematic form the circuit arrangement for electrical correcting. A distributor arranged for electrical correction has the impulse motor directly connected to the brush holder and correction is effected by altering the speed of the fork which determines the speed of the motor. When the resistance *R* is in series with the electromagnet of the driving fork at the speed-corrected station, the speed of the fork is slightly faster than that of the fork at the speed-controlling station, and when *R* is short-circuited the speed of the fork is slightly lower than that of the fork at the other station. The function of the correcting impulses which are generated from the signals themselves, is, therefore, to control the speed of the fork by means of the resistance *R*. The tongue of the corrector relay CR_1 follows the movements of the tongue of the line relay *L R*, but with a slight lag. Consequently, if the line relay tongue moves to its *M* contact, there will be a circuit from the + 110*V*, the tongue and contact *M* of the line relay, contact *S* and the tongue of No. 1 corrector relay CR_1, to the solid correcting ring, across the brushes to the segmented ring. If the brush is on an *A* segment the correcting impulse

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will flow through the left-hand winding of the No. 2 corrector relay CR_2 to the — 110 V. If the tongue of No. 2 corrector relay happens to be on its M contact, it will move to its S contact, thereby inserting the resistance R in the fork circuit and speeding up the frequency of the fork vibrations. The motor will consequently be rotated at a slightly faster speed so that by the time the brushes have swept over several segments they will be on an R segment at the moment a reversal occurs in the incoming signals and a correcting impulse is generated. Such correcting impulse would flow through the right-hand winding of the No. 2 correcting relay and cause its tongue to move to the M contact. The resistance R would be shunted out and the speed of the fork reduced. The brushes of the distributor are therefore always either leading or lagging but the frequency with which correcting impulses are received prevents the amount of lead or lag to be so great as to detrimentally affect the

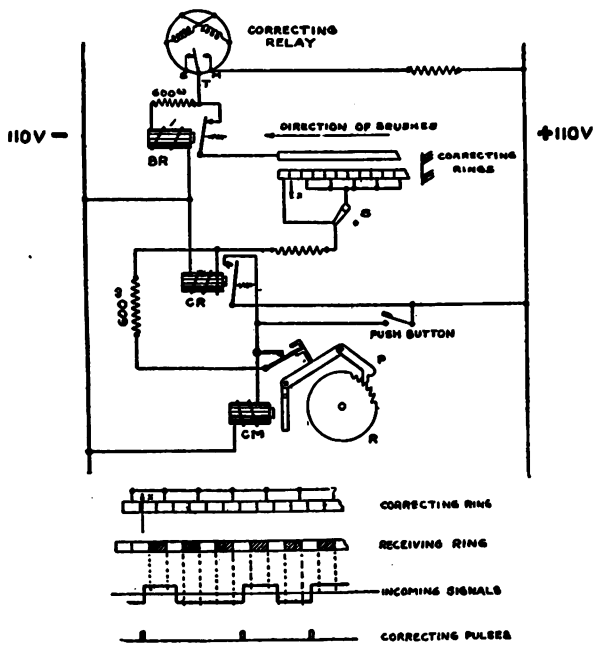

FIG. 34.

impulses which pass via the shortened segments of the receiving ring to the selecting relays of the printers.

Phase Finding. Proper phase relationship between the brushes in the case of the electrical correction method is secured by the speed-controlling station sending one complete current reversal per revolution, that is, positive current from segments 1 to 10 and negative current from segments 11 to 20. At the speed-controlled or correcting station, the connections to the segments of the corrector ring are altered, segments 1 to 20 form one big A segment and segments 21 to 40 one big R segment. The connection to the M contact on the No. 1 correcting relay is opened so that correcting impulses will be generated when the signal current polarity changes from negative to positive only. Consequently, there is only one position on the correcting ring where correction will take place and the brushes will either gain or lose with respect to the incoming signals, according as they are on the A or the R segment, until they are in synchronism, when correction will commence. All switches are then turned to normal.

Margin. The outer or receiving ring is mounted so as to be free to be rotated. This is for the purpose of placing the segments of the receiving ring in such a position with respect to the segments of the correcting ring that the middle portion of each signal shall be used for selecting purposes. Once synchronism has been secured, all switches at normal and the distant station transmitters turned off, each of the four printers will be receiving the "blank" signal. By moving the receiving ring in a clockwise direction until false signals are received, and then moving it in a counter-clockwise or opposite direction until false signals are again received, the midpoint between these two positions indicates the correct position for reception. The distance between the two positions where false signals are received is an index of the working margin.

In order that synchronism shall be maintained when all transmitters are turned off, the line battery connections of the first and third transmitters are reversed, so that four reversals of current will occur per revolution of the brushes and provide the necessary correcting impulses at the receiving end.

The connections to the first and third printers are adapted to meet these changes of battery at the sending end.

Operating Features and Economic Aspects

The function of a telegraph system is to provide a means for the prompt and accurate transmission and reception of communications as economically as possible. The merits of various telegraph systems can therefore be considered under the following heads:

1. Speed of Service.
2. Accuracy.
3. Operator Output.
4. Maintenance.
5. Line Economies.
6. Flexibility of System.

Speed of Service.

By this term is meant the average time taken in handling telegrams from the moment an operator at station A commences to perforate or to send a message until it is ready at station B for transference to some other part of that office, either for retransmission over another circuit or for delivery by messenger, have to undergo further handling. As such further handling, however, is not directly associated with or affected by the system of transmission over the wires, time occupied in this connection is not included.

Reviewing the methods of operation of the various systems under consideration, it will be shown

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wherein time losses, which occur in the high-speed systems, are avoided in the multiplex.

At the Sending End. In the high speed systems messages are first prepared by perforating operators, seated conveniently near to the transmitting operator who feeds the perforated tapes into a high-speed transmitter. In order that as little time as possible be lost by the perforating operators in passing the message forms with the corresponding tapes to the transmitting operator, it is the usual practice to perforate two or three messages on each tape. If such tapes are immediately fed into the transmitter, the first message has already undergone a delay equal to the time taken to perforate all three messages and the second message has undergone a delay equal to the time taken to perforate the second and third messages. The transmitting operator, however, has no time to sort out the tapes from the various operators so as to transmit messages in their exact order of priority. It usually happens, therefore, that a certain proportion of the messages undergo further delay before actual transmission takes place. It may be taken that the average delay in the case of high-speed systems is not less than three minutes.

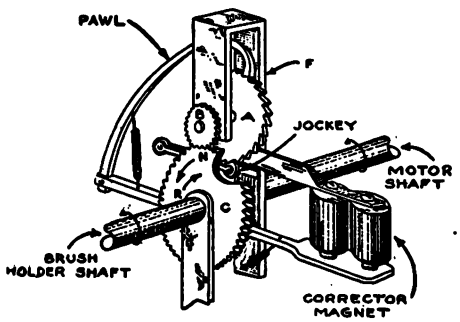

FIG. 35.

With a multiplex system, transmission over the lines takes place almost immediately the keys are actuated. In other words a multiplex provides practically direct connection between operator and operator, as is the case with Morse working.

At the Receiving End. There is not much difference between the high-speed and multiplex systems as regards speed of service, a slight advantage, however, resting with the multiplex.

Unfortunately, telegraph traffic does not glide along as smoothly as has been outlined above. Errors creep in and must be corrected. With the high-speed systems, a correction operator is required at each end of the circuit. Messages dealing with the correction of errors pass between these operators, and although given priority over other traffic, several minutes elapse in their transmission in each direction. Therefore, before an inquiry regarding a message can be received, a considerable number of other messages will have been transmitted, and unless these messages have been arranged in numerical order, some time is needed to trace the required message. Further delay will occur in the transmission of the answering message so that the total delay to a message in which correction is required may amount to many minutes.

With the multiplex systems the mode of working admits of such corrections being asked and obtained almost instantly.

In a paper read before the Post Office Telephone and Telegraph Society, London, on November 24th, 1913, Mr. John Newlands, Controller of the Central Telegraph Office, states:

> There is no doubt that all existing systems of telegraphy which involve the preliminary punching of each message tend to create delay, because even when the punching operation is completed the message is not yet on its way, the process of transmission through the transmitter has still to be carried out, and when there are two messages on each and each separate slip must perforce await its turn--there is always an appreciable loss of time, which does not take place, for example, on the Baudot System nor even in Morse keying.

It is interesting to note that this advantage of multiplex operation has been recognized in England and an effort has been made to adapt the Wheatstone system to the multiplex principle, so far as transmission is concerned. The arrangement is as follows:

Beside each perforating operator is a motor-driven Wheatstone transmitter. These transmitters are connected to an electromagnetic rotary switch which is arranged to switch the line to each transmitter in sequence. The switch is actuated by a signal from the transmitter to which it is connected, each actuation transferring the connection to the next transmitter. When perforating operator No. 1 completes a message, he depresses a special key on the perforator which perforates a hole in the tape, not in alignment with the signal holes. As this hole passes through the transmitter, it causes actuation of the switch, which stops the motor of the No. 1 position transmitter and starts the motor of the No. 2 position transmitter, at the same time switching the line from No. 1 to the No. 2 transmitter. Similar operation at the end of the message transmitted by the No. 2 transmitter switches the line to the No. 3 transmitter and so on in rotation.

It is doubtful if such a scheme will prove satisfactory, however. Messages are not of uniform length, nor do operators perforate at exactly the same speed. It effects the elimination of the transmitting operator, but it is difficult to see wherein much improvement can be secured towards providing a quicker speed of service. The use of two or more high-speed transmitters which are operated intermittently involves added complexity and cost to the sending end apparatus.

ACCURACY OF PRINTING TELEGRAPHS

Whatever may be the system of telegraphy employed, the standard of accuracy is dependent upon the care with which the messages are checked. In Morse working, the receiving operator is expected to check the accuracy of a message while performing the mental operation of translating the dots and dashes into letters and the physical operation of re-

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cording them on a typewriter. Actually three functions are performed simultaneously:

1. Translating telegraphic signals into letters, mentally.

2. Operating a typewriter, selecting correct keys.

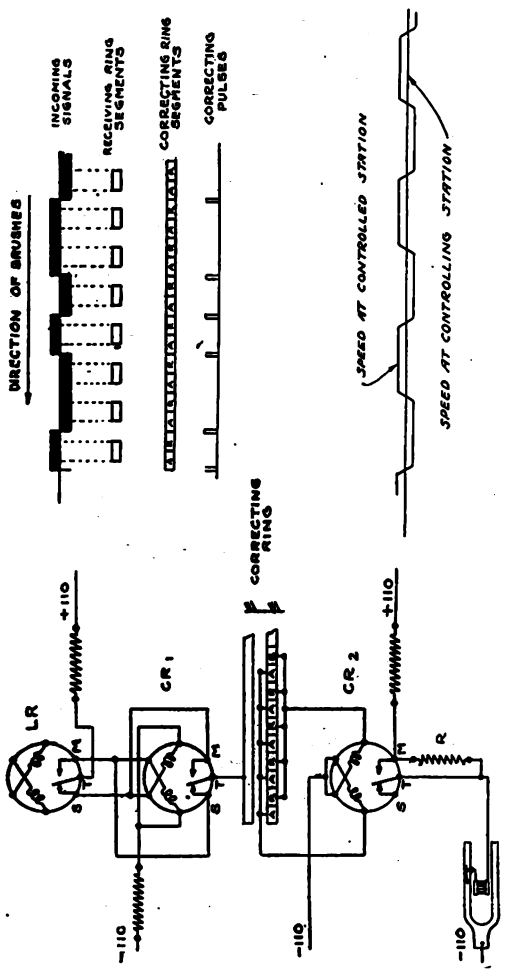

FIG. 36.

3. Scrutinizing the typed copy to see that it contains no errors.

Although it has been claimed that the two first operations are performed entirely automatically by skilled operators, such is not the case except in rare exceptions. If a function is being performed automatically, that is, requiring no attention of mind, then the mind can be employed on some other function. It is only necessary to request a Morse operator to read some message other than that he is in the act of receiving, or to engage him in conversation to show how little attention he is able to give it, without interfering with his main task. Psychological authorities agree that if the mind be engaged in two or more independent actions the principal action is hampered by the side issues.

Apart from its being a slower process than Morse sounder working, the translation of telegraph signals from a tape as in the Wheatstone system involves a division of attention between the tape and the sheet on which the message is being written or typed with the result that the liability to making errors is increased. When continued for a long period it also tends to produce eye strain.

A page-printing system necessitates only the checking of the messages, and consequently that work can be given undivided attention by the operator, with the result that it is done better.

It may be of interest to mention that a European telegraph administration, desirous of securing data in regard to undetected telegraphic errors, caused a careful examinations to be made of a large number of messages which were handled by different telegraph systems. This examination showed that the number of undetected errors per 100 messages was as follows:

Morse tape recording	0.11
Morse sounder	0.09
Hughes printer	0.04

It is understood that the introduction of the multiplex printing system in Western Union service has resulted in a proportionate improvement as regards accuracy, closely approximating these figures.

When it is realized that telegraphic errors often result in financial loss, as well as involving considerable expense in official correspondence and investigation, the greater accuracy secured by a printing system must be regarded as an important factor in its favor.

(To be concluded.)

Telephone Pioneers' Convention.

The Telephone Pioneers of America will hold their annual convention this year at Montreal, Que., on September 10 and 11. This year's meeting will be the seventh annual gathering of the members of the society. R. H. Starrett, secretary, reports that arrangements are already under way to provide hotel accomodations, special trains, and entertainment at Montreal. All telephone pioneers are invited to plan their summer schedule so they can be in Montreal on September 10 and 11. Members will be advised later as to details in regard to transportation facilities and as to the program for entertainment.

New RADIO Book

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This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser."

It is surprising how few people know how and by what process their cablegrams are handled; especially is this true of business people who write scores of cablegrams daily.

One person, now held in high esteem in his country, when visiting a cable station, being told that it was necessary to keep cable ships for repairs of cables, replied in astonishment: "Why, do cables break?"

Visitors to modern cable stations have been surprised at the wonderful system and manner in which a message is transmitted. It is also true that persons actually making a living out of the business—operators, and we must call them so—pound a telegraph key and send and receive messages without ever being sufficiently interested to find out "What makes the wheels go around," and find out something at least about the fundamentals of a vocation that they have chosen for life. What would you think of an engine driver who regarded his locomotive with this indifference?

Every encouragement is given these days to employees who wish to advance along the lines of knowledge. "Knowledge is power," and the more an operator knows about the system he is working, the better for himself and for his employers.

An official of a cable office not long since noticed an office boy of about fifteen years of age with a correspondence school pin in the lapel of his coat. He called the boy aside, and said: "You belong to that?" "Yes," replied the boy, "I'm taking a telegraph engineering course, sir." Watch that boy. He will advance.

A system that is "the nerves of the universe" is one worth associating with, and operators who say there are no chances for promotion do not see above the haze of their own imagination.

One cable company has spent considerable money and utilized its best talent in providing correspondence courses covering the various branches of its system.

Let us look into this submarine world, then, and see if we can find out something of this wonderful network of "live wires" which are wound around our earth, and some of the systems worked therein.

We must begin with the cable first. Let us turn to history and pay a word of tribute to the pioneers who started the submarine cable business.

String a cable across the Atlantic! Easy, these days, but what an undertaking in the beginning! And the funny and quaint ideas some people held regarding the proposal. One man actually thought it was a cable with a movable string on the inside and that certain pulls on the string meant certain signals.

Lay a cable! Can it be done? Will it work? The money? Will it pay? Difficulties? Let us see, and we must be brief:

Previous to 1857, short submarine cables were laid and successfully operated. In that year Cyrus W. Field, an enterprising American, took up the subject of laying a submarine cable across the Atlantic. Many things had to be considered, such as type of cable, number of strands for the conductor, thickness and quality of the insulation, protection for the insulation and then outside protection of armor wires; size, weight and strength of the cable; manufacturing same and putting it aboard

Deep Sea Cable—Cross-Section.

ship and laying it out again. Weather and other obvious conditions had to be dealt with.

In the year mentioned the first attempt to lay an Atlantic cable, which Field undertook, failed, for it parted at a distance of three hundred and thirty miles from land.

The second attempt was made again by Field in 1858 and the cable was actually completed, but after three weeks of imperfect working the insulation became faulty and operation had to be abandoned.

These disasters checked the enterprise for a number of years, and it was not till 1861 when a deep sea cable was successfully laid and operated between Malta and Alexandria, and in 1864, when one was laid across the Persian Gulf, did the promoters gain sufficient courage to dare another attempt to tackle the Atlantic.

In 1865, Field again made the attempt, using the *Great Eastern* for the task, but when 1,186 miles went overboard the cable parted and operations were abandoned for that year.

In 1866, the undaunted Field again made another and successful attempt, the *Great Eastern* being used for the task, and "Cyrus laid the cable."

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This 1866 cable was made up of the abandoned section of the 1865 cable and, I understand, parts of these cables still form links of a cable which is in operation today—going "strong as ever."

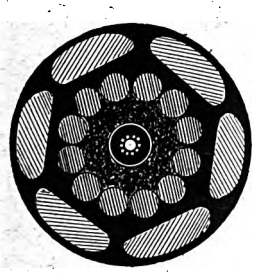
This success, which was so important to the world's political destiny and to international commerce, was the forerunner of other cables. Countries widely apart were brought into intimate relation and became sharers in the intelligence, progress and civilization of each other.

The cable system which began under such gigantic problems has now worked itself up to such a factor in the life of our world that the old Earth has itself practically tied around and around with a network of submarine cables, and necessity has brought into use many inventions for working these cables. The mirror has taken the place of the needle galvanometer, and the siphon recorder the place of the mirror; the magnifier has again supplanted the recorder—What next?

Cable Routes.

A cable is less liable to injury in deep water than in shallow, and the shore ends are larger than the deep sea sections. Cable landings have to be chosen where there is little or no shipping, as ships' anchors hooking the cable, would be a continual source of trouble. The shorter the cable, the less the cost, and the greater the speed at which it will carry signals. The speed ratio works by the well known rule of "double the length of the cable and you quarter the speed." We shall explain more fully later on just what is meant by this.

Pieces of cable have been recovered that have lain on the ocean bed for over forty years, and their condition has been practically the same as when the cable was first laid. This, of course, depended on the nature of the bottom of the sea. The very best material is now used in the manufacture of a submarine, so that the cost of an ocean cable is in seven figures.



SHORE-END CABLE—CROSS-SECTION.

Soundings have to be taken as to the nature of the sea's bottom. This procedure was followed as far back as 1856, when British and American naval officers made soundings with a view to determining the best route for an Atlantic cable. Sudden changes in depth must be avoided, also undercurrents from river mouths. A sandy bottom is preferred to a rocky one. Iceberg conditions also have to be dealt with.

A wise choice of a cable route may save thousands of dollars to the cable company, and the costs of special surveys of cable routes are amply repaid by avoiding dangerous routes, thus cutting down the number of future repairs.

Special instruments are now used for sounding and surveying the route, among which may be named Thomson's tubes, Sherlock's detacher for sinkers, Silvertown detaching gear, Silvertown sounding tube, Stallibrass sounding tube, Lucas

SHORE-END TYPE OF CABLE WITH THE VARIOUS LAYERS STRIPPED.

sounding machine, Lucas snapper, water and mercury piezometers; thermometers of various makes.

The Ship.—All cable ships are specially fitted for laying cables and for cable repair work, the average gross tonnage being 1,000 to 1,500 tons. The *Great Eastern* will always be remembered for her work in laying the Atlantic cables. Other modern ships may be mentioned, such as the *Colonia, Telconia, Faraday, Iris, Lord Kelvin, Minia, Mackay-Bennett,* and *Electra.* One important feature of the ship is a good testing room, and this contains all up-to-date testing instruments for making various kinds of tests on the cables.

The bow of the ship is specially constructed with a platform extending outward over the bow. The ship has cable tanks in which the cable is stored. Sometimes three or four tanks are provided. The cable then carried can be properly distributed and, besides, it keeps the ship in trim. Some tanks have large circular centers which are utilized to carry water ballast and are known as water ballast tanks.

The cable is always coiled in the tanks in a clockwise direction from the outside rim inwards. When laying out cable, or when it is coming on board,

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men are stationed in the tanks at certain distances to keep the cable from acquiring kinks.

The ship is fitted with special picking-up gear and winches, an important machine being the dynamometer which registers the strain on the cable being lifted or being laid out. Different types of grapnels are carried, certain forms being used according to the nature of bottom over which grappling is to be done, names of grapnels being "Mance's," "umbrella," "centipede," "Trotts," "Benests," and "Jamieson's."

The ship, when on repairs, steams slowly over the cable at right angles to it. The experts on board can generally tell by the strain on the dynamometer as soon as the cable is hooked. The ship, when arriving on the ground, ascertains her correct position over the cable and then puts out marking buoys. She carries a number of these which weigh about eighteen hundred pounds each. They are made of steel and are filled with gas. In addition to the officers of the ship, one of the most important positions is the "jointer." He makes the splices, and this branch of the work has to be done very accurately.

A person might ask, "How long does it take to hook the cable on a repair?" It depends largely on the nature of the bottom. A cable ship in mid-Atlantic has been known to "hook" the cable the first throw of the grapnel, but sometimes it takes half a dozen trials before the task is accomplished.

One of the latest types of repair ships is the *Lord Kelvin,* owned by the Western Union Telegraph Company. She is an oil burning boat and has embodied in her equipment all modern improvements.

(To be continued.)

Proposed Telegraph Tournament.

George W. Smith, Jr., one of the winners in the Railroad Telegraphers Event, at the San Francisco tournament in 1915, writes from Philadelphia, Pa., that he is now employed in the telegraph department of one of the large steel companies. Mr. Smith expresses the hope that when plans are made for the proposed contest that one event be arranged in which private wire telegraphers employed by industrial concerns may participate.

Book on Alternating Currents.

Arithmetic of Alternating Currents, is the name of a new book by E. H. Crapper. For those who are familiar with elementary mathematics, this book will be found valuable as it describes in a thorough manner periodic and alternating currents; generation of alternating electromotive forces; inductances; inductive circuits; capacity and condensers; resistance, inductance and capacity in parallel; static transformers; induction motors and transformation of currents.

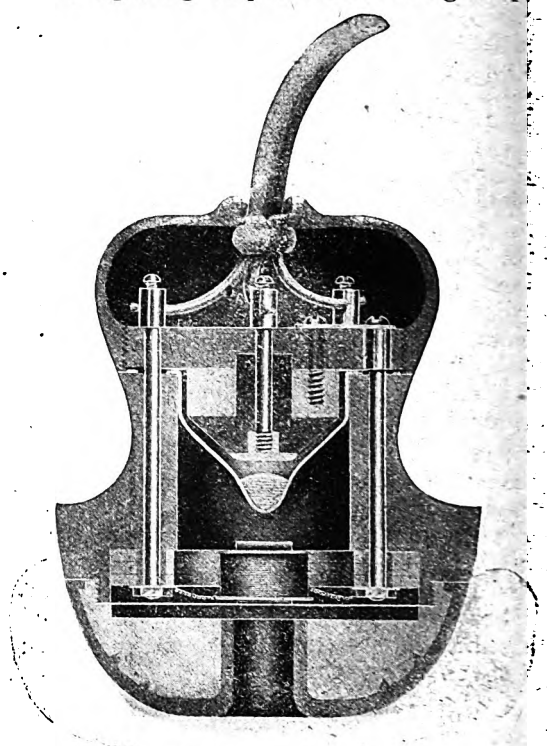
The book contains 208 pages. Price $1.25. Copies may be purchased from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Automatic Receiver for Manual Telephone Systems.

The illustration presented herewith shows a cross-section view of a telephone receiver invented by E. E. Ries, an electrical engineer of New York, and who is the inventor of other electrical devices.

The new receiver is of about the same width and half as long as the present standard desk-set receiver, the electro-magnet and permanent magnet being inclosed in a hard rubber or fiber shell similar to the present receiver.

The novelty of the invention is that the receiver is not used to close the signaling circuit from subscriber to central in central energy systems. With the standard desk set, when the receiver is removed from the hook, a spring acts to close a contact which causes the signaling lamp at central to light up, and



NEW TELEPHONE RECEIVER.

when the conversation is finished and the receiver replaced on the hook, the signaling circuit is disconnected and remains so until another call is made.

The Ries receiver has a self-contained switching element which renders unnecessary switching gear inside the telephone stand. The receiver does not need to be hung on a hook, but may be set on a desk anywhere within reach of the user.

The principle of operation is as follows: It may be noted in the illustration that in the center in a sealed cup-like receptacle is a deposit of mercury. When the receiver is lifted from the desk and moved toward the ear of the user the mercury falls in a direction so that it effects a momentary electrical contact between the metal of the cup and a contact disk, shown just above the mercury in the illustration. The closing of this contact accom-

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plishes the same purpose as does the switch-hook in a standard desk set; that is, it closes the signaling circuit which attracts the attention of the operator at central.

In an attempt to attract the attention of the operator at the central office, should the operator not respond promptly, when this receiver is used, it is not necessary to "juggle" a switch-hook. It is necessary only to tilt the receiver slightly so that the column of mercury may once more make a momentary contact.

The use of a receiver of this type does away switch-hook troubles, and as the quantity of mercury employed is sufficient to in all cases insure proper contact between the points to be connected, it would seem that the operation of the signaling circuit is at all times positive, and the contact of sufficient duration to give a positive signal. One difficulty with the switch-hook is that the average telephone user, not understanding the necessity for reasonably prolonged contact, operates the hook too rapidly to permit the lamp at central to light up. Also, it is evident that the entire list of service defects, resulting from users failing to restore receivers to the hooks when through talking, are avoided by the use of the Ries receiver. The receiver is so designed that no matter how it may be set down on a table or desk it will automatically assume an upright position, thereby disconnecting the signaling circuit to central.

Civil War Telegraphers' Pensions.

House Bill No. 5815, looking to the granting of pensions to the few remaining survivors of the Telegrah Corps who served the Government during the Civil War, has been favorably reported by the Committee on Military Affairs. Mr. Crago, a member of the committee, has forwarded the following report along with the bill for the information of the members of Congress and of the Senators who will consider the matter:

"The Committee on Military Affairs, to whom was referred the bill (H. R. 5815) granting relief to persons who served in the Military Telegraph Corps of the Army during the Civil War, having considered the same, report thereon with a recommendation that it do pass.

"The bill as reported is intended to give to the persons indicated a military status and place them on the same footing as other members of the Army of the United States who served in the Civil War, and accord to them at this late date the privileges of pension, etc., to which your committee thinks they are justly entitled.

"During the Civil War the Military Telegrah Corps consisted of about 1,500 operators and a sufficient force of linemen. They built and operated 15,389 miles of telegraph lines exclusively devoted to military purposes. In addition to this many lines of commercial companies were taken over and made use of by the Government.

"The service was creditably performed, and the reports of the Secretary of War and the commanding generals bear uniform testimony to their efficiency, intelligence, and patriotism. Their duties were purely military and were performed with the same exposure to the dangers of the battlefield and disease as fell to the lot of the officers and soldiers of the army. These men now designated by previous legislation as members of the Military Telegraph Corps constituted an integral and vitally essential part of the army and brought this new system of communication in the army to a state of perfection never before equalled in military science. The duties imposed on these men required the service of persons of peculiar intelligence, and its members were picked from the great number of operators on account of special prominence acquired in what was at this time a mysterious art. These duties were almost continuous, unrelieved by the excitement and relaxations of ordinary camp life. And it is somewhat surprising that these men were not organized at this time as a department of the army.

"The official record of the service of these men is to be found in the pay roll and notices in the general reports. It is known that of the entire number of men employed, 199 were either killed, died of disease, or were captured while in the line of duty. It is estimated that more than 100 others suffered from the casualties of the service.

"As early as April 22, 1861, eight days after the fall of Fort Sumter, Andrew Carnegie, who at that time was assistant general manager of military railroads and telegraphs, made requisition on the superintendent of telegraphs, Pennsylvania Railroad Company, Altoona, Pa., for some of his best operators to proceed to Washington at once prepared to enter the Government service for the war. This was practically the beginning of the United States Military Telegraph Corps, which afterwards constituted the very nerves of the army.

"The members of this corps were field couriers with special and arduous duties to perform—duties involving great responsibilities.

"General Grant, in his memoirs, tells us how his own headquarters and those of his army and division corps commanders were kept in constant touch with each other in camp at the close of each day's march, and he makes the following comment:

" 'Nothing could be more complete than the organization of this body of brave and intelligent men. In very many instances our offices were worked in the very front lines of battle. No orders ever had to be given to establish the telegraph.'

"Hardly a day intervened when Gen. Grant did not know the exact state of facts between himself and Gen. Sherman, more than 1,500 miles away, as the wires ran.

"The history of this great war is replete with the achievements and work of this body of loyal men who received in pay and compensation no more than the enlisted man in the ranks when you take into consideration the fact that they were compelled to clothe and support themselves.

"This report cannot well go into details as to the service performed by these men, but a careful read-

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ing of the hearings before the subcommittee of the Committee on Military Affairs of the House of Representatives will present many interesting facts concerning the service of these men. At the present time and for years past the service performed by these men is recognized in our army organization as military service of the highest character, and is a service which calls for highly trained men. The men for whom we are enactng this legislation were the pioneers in this work. They blazed the trail which has been followed by all armies of all civilized nations, and today this service is recognized as one of the most essential branches of the army service.

"Referring again to the reason for not making these men at that time a recognized part of the military establishment we must recognize that the value of this service was then but little known, and the further fact that the Secretary of War, while appreciating the value of the service, thought that by having these men directly under him, and not subject to the immediate military control of the different commanding officers, he would have a closer touch with them; and as the secrets of the army as well as of the nation were to be intrusted to these men it was the opinion of the Secretary of War that he should have these men entirely under his control and not under the command of their superior officers.

"By taking this attitude concerning this corps these men have been deprived of the rights and benefits which have been conferred upon other men who so faithfully served their country during this critical period.

"The testimony before your committee discloses the fact that the survivors of this corps number at the present time less than 200 men; that, deducting from this number 40 commissioned officers and enlisted men, would leave but 160 men to be benefited by this legislation, and investigation discloses the fact that 43 widows of these men would benefit by the provisions of this act; and the total amount for the first year necessary to comply with the provisions of this act would not exceed a total of $45,000. This sum would be very rapidly reduced as the years go by.

"Under an act of Congress approved January 26, 1897, entitled 'An act for the relief of telegraph operators who served in the War of the Rebellion,' the services of these men were recognized, and a certificate of honorable service in the Military Telegraph Corps of the army of the United States was provided for in this act. Under the terms of the present bill only the men who have received such certificates, or are entitled to receive such certificates, or the widow of any such man, would be entitled to any benefits.

"In view of the investigation as made, and taking into consideration the degree and value of the service rendered by these men, your committee believes that it is a simple act of justice on the part of the Government to give these men the status to which they are entitled."

CANADIAN NOTES.

Great North Western Telegraph Company.

B. A. BOATE, formerly manager at Brandon, Man., has been appointed manager of the office at Regina, Sask., vice R. F. Errington, transferred.

B. S. ROUND, chief operator at Winnipeg, Man., reports the arrival of a son on May 15.

Messenger Boys Advance.

W. J. Camp, assistant manager Canadian Pacific Railway Company's telegraphs, states that employment as a messenger boy in any of the company's large offices is a stepping stone which places a bright youngster where he may have a choice of positions. The training a boy gets in the telegraph business quickly qualifies him for a rapid fire position in any line of work. In the Winnipeg Man., office of the company during the past fourteen months, thirty-three boys employed in message delivery have graduated to positions in the offices of members of the Winnipeg grain exchange.

At first sight it may appear that losing the boys after they have learned how to handle telegrams promptly counts as a positive loss to the telegraph company, but this is not so. The fact that the boys generally enter the service of firms which do a considerable amount of telegraphing, in many ways reacts to the advantage of the telegraph companies

Convention of the Old-Time Telegraphers' and Historical Association.

George D. Perry, president of the Old Time Telegraphers' and Historical Association, announces the appointment of the following committees, in connection with the work of arranging for the 1920 convention which is to be held in Toronto, Ont., August 31 to September 1, inclusive:

Membership Committee: W. J. Duckworth, chairman, C. W. Dawzy, and H. J. Lillie: Finance Committee; J. J. Seitz, chairman, D. E. Henry, A C. McConnell, and S. B. McMichael; Entertainment Committee; A. C. McConnell, chairman, W. G. Barber, C. E. Dawzy, and C. E. Lillie; Publicity Committee: S. B. McMichael, chairman, G. Hogarth and R. H. Hathaway; Hotel Committee; Charles E. Davies, chairman, G. Hogarth and W. G. Barber; Badge and Supply Committee; George Watt, chairman, George Joliffe and G. Matthews: Ladies' Committee: Mrs. McMichael, chairman, Mrs. Perry, Mrs. Neil, Mrs. Davies, Mrs. Duckworth, Mrs. H. J. Lillie, Mrs. Hogarth, Mrs. Paton, Mrs. Barber, Mrs. Watt, Mrs. C. E. Lillie, Mrs. Joliffe and Mrs. Matthews.

Already many American members of the Association have signified their intention to attend the gathering in Toronto, and the Canadian members propose to uphold Toronto's reputation as the Queen City of conventions.

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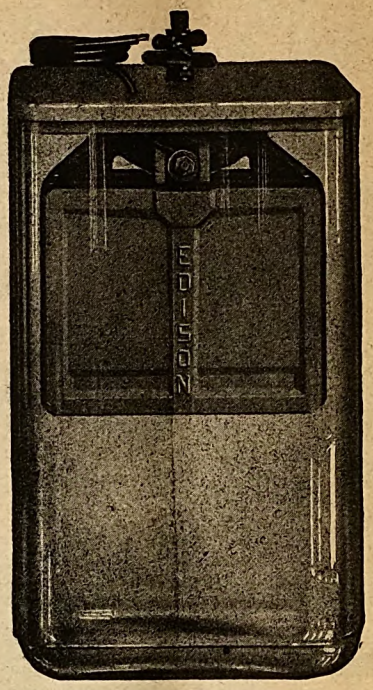

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THE RAILROAD
TELEGRAPH AND TELEPHONE

C. A. PLUMLY, superintendent of telegraph, Baltimore and Ohio Railroad, accompanied by F. G. Adams, were New York official visitors on May 13 and 14.

COMMITTEE NO. 4, Protection Against Lightning or Electric Light and Power Circuits, I. C. Forshee, chairman, met in New York on May 20 and 21. The other members of this committee are: L. Behner, W. L. Cook, H. W. Drake, W. M. Gould, G. H. Mayer, N. Norton, Stanley Rhoads and H. A. Shepard.

Great Northern Railroad.

Effective May 1, J. H. McGlogan was appointed assistant superintendent of telegraph, lines east of Williston, N. D., with headquarters at St. Paul, Minn. On the same date A. W. McKay was appointed assistant superintenent, lines west of Williston, with headquarters at Spokane, Wash. E. E. Thompson is commercial telegraph agent, in charge of development of commercial telegraph traffic and service, with headquarters at St. Paul, Minn.

Soo Railroad Telegraph Department.

G. H. Mayer, superintendent of telegraph, Soo Line, with headquarters at Stevens Point, Wis., during the past few years has built up a thoroughly efficient staff of assistants who have charge of the various districts of the company's lines.

Mr. Mayer, himself a practical construction man and electrician, has since his appointment several years ago urged his men to study the theoretical side of the business, and the various foremen, chief operators, and linemen are constant readers of telegraph and telephone literature. Each man owns and studies several good books on these subjects.

That this sort of education pays is evidenced in the fact that the company's telephone lines are maintained at a high state of efficiency, and the operating department of the railroad has the benefit of communication lines which are second to none in the country. A month or two ago when a disastrous tornado wrecked all lines entering Chicago, the first service restored between northwestern railroad terminals and Chicago were the lines along the Soo Railroad—the result of Mr. Mayer's rapid-fire supervision and intelligent cooperation of his assistants.

Some of the men responsible for the good showing made in maintaining telegraph and telephone service are P. H. Cardinell, Chippewa Falls, Wis.; S. D. Hodson, Mellen, Wis.; F. C. Buchan, Waukesha, Wis., and P. H. Plant, Ladysmith, Wis.

Grand Trunk Pacific Railway Telegraphs.

H. Hulatt, manager of telegraphs, Grand Trunk, and Grand Trunk Pacific Railways, announces that effective May 17, R. M. MacMillan was appointed division superintendent of telegraphs (Central Division) with offices at Winnipeg, Man., vice F. T. Caldwell, resigned to enter other business. Mr. MacMillan will have jurisdiction over all matters appertaining to construction and maintenance of telegraph and telephone lines, and operation of railroad and commercial telegraphs.

Effective the same day, J. A. C. Kelman was appointed telegraph traffic supervisor, Central and Western Divisions, with office at Winnipeg, Man.. vice Mr. MacMillan promoted.

Mr. MacMillan has been in the telegraph business for the past sixteen years. Starting with the Western Union Telegraph Company in Sydney, N. S., in 1904 as messenger, he worked up through various positions of clerk, operator, and city manager in that office, and later held an important position for that company in their Halifax office. In 1911 Mr. MacMillan went west and after working with the Canadian Pacific Railway Company's Telegraph for a short time joined the Winnipeg staff of the Grand Trunk Pacific Railway. Following that, he occupied the position of city manager at Regina, Calgary, and Edmonton. In 1917 owing to Mr. Caldwell being granted leave of absence, having joined the American Expeditionary Forces, Mr. MacMillan was appointed acting division superintendent of telegraphs, and—upon Mr. Cald-

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well's return one year ago from overseas and resuming duties—he was appointed traffic supervisor, which position he has held up to the present time.

Mr. Kelman has been in the service of the Grand Trunk Pacific Railway Telegraphs during the past twelve years as operator, chief operator, and circuit manager. Before entering the company's service, Mr. Kelman had considerable experience in the employ of the Great North Western Telegraph Company and the Canadian Pacific Railway Company's telegraphs, at important stations in the east and in the west.

E. A. Speer, of the Canadian Pacific Railway Company's Telegraphs.

The accompanying photographic reproduction is of Mr. E. A. Speer, telegraph inspector, at Toronto, Ont., in the service of the Canadian Pacific Railway Company's Telegraphs.

Mr. Speer was born at Norwood, Ontario, on December 26, 1861, of Scotch and English parentage. He entered the service of the company in the year 1888, in the capacity of lineman, at London, Ont. Ten years later he was appointed foreman,

E. A. Speer.

with headquarters at Toronto. From 1904 until 1909 he was assistant inspector of the Ontario district, and was then appointed superintendent of construction, in which position he remained until the position was abolished in 1915 on account of the demands of war ending for a time construction and repair work.

Mr. Speer is now, and has been during the past four years, inspector of telegraphs of the Ontario district.

Telephone Association Meets.

The United States Independent Telephone Association will hold its 1920 convention at Winona Lake, Ind., June 15, 16. 17 and 18.

LIGHTNING ARRESTERS FOR TELEGRAPH AND TELEPHONE LINES, INCLUDING PROTECTION AGAINST HIGH-POTENTIAL FOREIGN CONTACTS.

By Rudolf Wolf.

The protection of telegraph and telephone instruments against the effect of lightning is as old as the existence of these instruments. In the years past these protecting devices have undergone many changes, many new ideas were developed and used in practice with more or less satisfying results. Even at the present time there is a variety of lightning arresters in use which it would take some time to enumerate; but all these arresters are practical applications of either one of three basic principles, viz.

1. Arresters using an air-gap between line and ground; this air-gap being of less apparent resistance to the passage of lightning currents than the instruments to be protected.
2. Vacuum Arresters; these being arresters of type 1 with the spark gap in a vacuum to give a greater distance between spark-points.
3. Arresters consisting of a reactance-coil in parallel with an air-gap.

The purpose of the present article is to describe improvements recently made in the design of the well-known Argus type of arrester.

In order to give this description it is perhaps not out of place to say something about lightning first.

Lightning is admittedly a violent discharge of atmospheric electricity. Atmospheric electricity is always present but ordinarily it seems to be in a balanced condition as to its effects on telegraph and telephone lines, with the result that its effects are not directly noticeable. It becomes a factor to account with, though, at the least unbalancing. Systematical research into the nature of lightning and atmospheric electricity is of comparatively recent date and far from being complete. This research primarily conducted for the benefit of radiotelegraphy showed that a ligthning discharge is comparable to a powerful electromagnetic wave of very high damping. In other words, lightning is an alternating current of a frequency changing through a very wide range while it is flowing. A telegraph system is comparable to a condenser. The line forms one plate, the ground the other; and the instruments, due to their enormously high impedance, can be taken as a poor dielectric. This theory works out in practice as follows: An alternating current of high frequency is impressed on line and ground; in its course it meets the telegraph instruments. As the apparent resistance of the insulation of the magnet windings is less than the impedance of the magnet windings, this insulation will be broken down and the spools will be "burned out." If now an inductance coil is inserted in the

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line before the instruments, and means to form a spark gap to ground are provided in close proximity to this inductance coil, an alternating current of high frequency finds less resistance jumping this small air-gap to ground, than passing through the inductance coil and the instrument to ground.

On this theory the Argus lightning arrester was designed. The proper dimenions of impedance and length of spark-gap were found as the result of numerous field tests under actual working conditions. On close examination of an Argus arrester it is found that the air-gap is shortest in the center and becomes larger towards the ends. Consequently, a discharge of a small amount of atmospheric electricity will take place at the center, and as the discharge increases will take in more and more convolutions of the coil. This increase of the discharge is comparable to the approach of a lightning storm. With a storm far away there is only an occasional spark at the center of the Argus arrester. As the storm approaches this spark becomes more frequent and takes in more convolutions of the coil until, finally, with the storm overhead, the whole arrester discharges with each stroke of lightning.

That these statements are not purely theoretical is proven by the performance of the Argus lightning arrester in actual practice. There is not one case to our knowledge where the Argus lightning arrester did not absolutely protect the instruments it was guarding. But we know of cases where a direct stroke of lightning destroyed the arrester, and yet the instruments guarded by this arrester were unharmed.

Lightning, though, is not the only danger to telegraph and telephone instruments. Another cause equally as disastrous to the instruments is a sudden cróss of line and a so-called "high-tension" wire. Adequate protection against the effects of such a cross has to be provided. The fundamental facts underlying such a cross are so radically different from lightning that it cannot be expected that an arrester designed for lightning protection will also efficiently protect against high tension surges.

Let us again first analyze what happens when a high tension wire crosses a telegraph line. Under "high-tension" in this connection we assume any potential above 500 volt a. c. or d. c. In the majority of cases high-tension to be guarded against will be an alternating current of 60 cycles and several thousand volts, carrying a rather heavy current. The impedance of the instruments to the flow of an alternating current of 60 cycles is still very high, yet it cannot be compared to the impedance of the same coil to the flow of a lightning current. Taking line and ground now again as two plates of a condenser, and the instruments as the dielectric separating same, it becomes apparent that this dielectric is so poor comparatively that it will offer almost no resistance to a flow of current from line to ground. The wire in the instruments is of such small diameter, and therefore of small current carrying capacity, that it will be fused by the passage of the high tension current. Naturally, a small inductance coil in the line which will effectively choke lightning currents, will be of no value to prevent the flow of low-frequency alternating currents.

In order now to protect telegraph and telephone instruments against the effects of high-tension currents the easiest way seems to be to use a small air-gap between line and ground. Of course the electrodes of this air-gap have to be large enough to carry a rather heavy current from the line to ground without becoming fused or even overheated. They furthermore ought to be made of a non-arcing metal. On the other hand, upon passage of a current above the designed value of the gap, they should readily fuse together. The problem therefore had its difficulties.

At the end of an extended series of experiments we arrived at our new type "C" Argus Lightning Arrester and High Tension Protector.

The object of these experiments was to design a lightning arrester to combine with a high tension protector that would meet the requirements of telegraph and telephone companies as to workability, at the same time keeping the cost reasonably low.

We solved the problem by securing an additional plate to one of the line binding posts, this plate forming one electrode of a spark-gap of which the other electrode was the already existing ground plate of the Argus lightning arrester. The very desirable feature of having this air-gap tapering was met automatically by the already existing taper of the ground plate. The smallest distance between ground and protector plate for protection against crosses with high tension circuits of from 500 to about 1,200 volts was found to be .004 inch. This air-gap, once broken down by an excessive voltage, will lend itself readily, due to its tapered form, to carry off in a self-extinguishing arc any current which will not blow the line fuses.

A Real Improvement.

The local battery problem for the operation of telegraph sounders is one that in the course of time confronts every telegraph engineer. The diaphragm telegraph sounder attachment for main line relays, manufactured by the Railways Labor-Saving Device Company of Davenport, Iowa, has recently been improved to a point where it is now a thoroughly practical substitute for the ordinary separate sounder. The device is attached to the contact points of the relay, and with but ten miliamperes in the line, using 150 ohm relays, the sound produced resembles very closely the signals given by an aluminum lever sounder operated by primary battery. Inasmuch as the device requires no local battery to operate it, the saving is apparent.

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Students' Course in Technical Telegraphy

No. 6.

In article No. 5, in the May 16 issue, we had something to say about electromagnetism and electromagnets as related to telegraph instruments and to electric generators used to supply current for the operation of lines and instruments, and while we are on the subject of generators it may be well to present a sketch or two showing how generators are wired through switches and resistance coils to operating sets.

In service, machine-generators have the brushes which rest on their commutators so mounted that the armatures are to be revolved in a given direction. This provides that at one brush of each machine the potential will be positive — sometimes called *plus*—while at the other brush the potential is

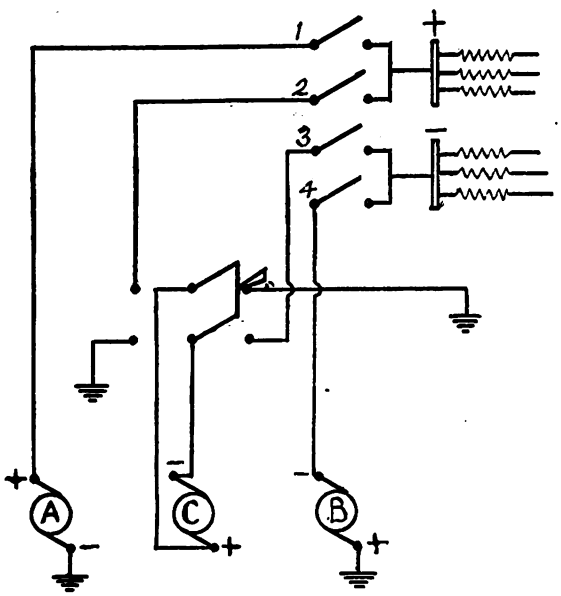

FIG. 16.

negative, or *minus*. For the operation of single Morse circuits, either positive or negative current may be applied to the line at one end. If battery is applied at the distant end of the line the opposite polarity must be applied. And, regardless of which polarity is applied to line at a terminal office, the opposite brush of the generator is connected to the earth. This must be, because if a single wire is used in operation the earth forms the return path for the current.

Fig. 16 shows the actual wiring of three generators at one station (motor switch and starting-box omitted), in which machines *A* and *B* are permanently connected to send out positive and negative current respectively. In each case the opposite pole of the generator is permanently grounded. When switch 1 and switch 4 are closed, machines *A* and *B* are connected directly to separate bus-bars, one marked plus, the other marked minus. Each of these bus-bars has connected to it one terminal of each of a number of resistance coils, as shown in the figure. These resistance coils may be of 100 ohms, 150 ohms, 200 ohms, or of any desired resistance depending upon the strength of current required in the circuit fed from a particular coil.

Generator *C*, in the center of the diagram, is so wired to a double-pole, double-throw switch that either its positive or its negative brush may be grounded, while, in either case, the opposite brush is connected either to the positive or the negative bus-bar by way of switches 2 and 3. The reason for wiring the third machine in this manner is so that in case of breakdown of the regular positive, or regular negative machine, the center machine may be used in its place until repairs are effected. In offices where machines are run twenty-four hours per day, it is customary to run each machine only a given number of hours continuously, using the third machine to relieve the other two in order.

Fig. 17 illustrates a wiring arrangement similar to that shown in Fig. 16. Extension wiring is included from one resistance coil attached to the positive bus-bar and from one coil attached to the negative bus-bar. The extensions are shown connected to the front and back contact points of a duplex transmitter.

To the student in his initial attempts to *find out where the wires go*, it is always somewhat mystifying to discover that after they leave instrument binding-posts the wires very quickly become conductors in cables. Occasionally students become discouraged because it seems hopeless to trace wires after they enter cables with a large number of other wires—the latter apparently not concerned in the investigation. Much valuable time will be saved if the student will endeavor simply to understand *where a wire starts from and where it goes to.*

Diagrams 16 and 17 should be helpful in this respect. The wire connections are plainly very simple, and even if the wires shown were bunched in cables, the end of each wire would be connected to

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the same point as if it were carried individually from contact to contact.

By referring back to Fig. 8, in Lesson No. 3, it may be seen how telegraph sounders are connected when machine generators are employed and when there is more than one sounder to be operated. In Fig. 8, no resistance coils are shown connected in the individual sounder circuits, which means that the generator is of low voltage, say 24 volts.

The inquisitive student early in his telegraph career discovers that telegraph sounders may be stamped as of 4 ohms, 10 ohms, 20 ohms, 150 ohms, or of some intermediate resistance. It depends upon how rapidly an instrument is to be operated what current strength is to be applied in the circuit. Operation with ordinary Morse hand keys requires somewhat less current strength in a circuit than if semi-automatic transmitters of the vibrating type are used. However, for ordinary purposes it may be assumed that a 4 ohm sounder requires one-half ampere of current; a 10 ohm sounder one-fourth ampere; a 20 ohm sounder one-sixth ampere, and a 150 ohm sounder one-tenth ampere. Knowing the resistance of the sounder and the current required to operate it, it is an easy matter to determine what voltage is necessary. The third simple formula given in Lesson No. 4 states that the required voltage may be ascertained by multiplying the current in amperes by the resistance in ohms. In the case of the four ohm sounder, which requires one-half ampere of current, this would mean two volts; for $4 \times \frac{1}{2} = 2$.

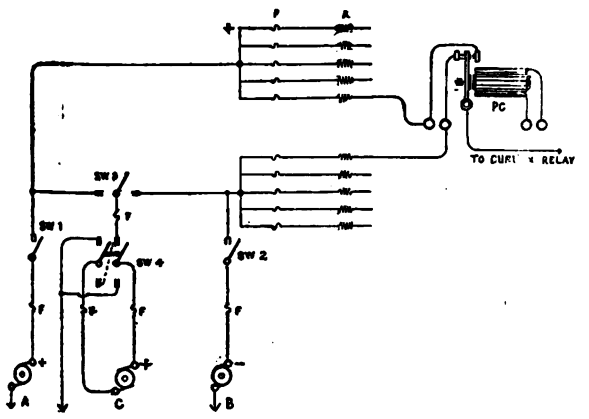

FIG. 17.

If, in a certain instance, the only generator available has a voltage of 24 volts, it will then be necessary to insert in series with the sounder a resistance coil of a value which will allow a current of one-half ampere to flow through the sounder. Let us see what the resistance of this coil should be The voltage is 24, and the required current is one-half ampere. According to the second formula in Lesson No. 4, the required resistance may be determined by dividing the volts by the amperes. Twenty-four divided by one-half equals forty-eight. But, the resistance of the sounder itself is four ohms, so that the resistance of the lamp or coil inserted in series with the sounder should be forty-four ohms.

Suppose the generator availiable had a voltage of forty-eight volts, what should the resistance of the extra coil be?

The writer is quite well aware of the fact that technical instructions, such as these, make dry reading, but it is particularly necessary that the student stick to the task until the possession of exact knowledge brings to him new powers and renewed confidence in his own ability.

This lesson should be reread until it is thoroughly understood.

In the following lesson we shall go into the question of relay resistance and explain what current strengths are required in circuits equipped with relays of given resistances.

(To be continued in June 16 issue.)

A. I. E. E. Convention

The thirty-sixth annual convention of the American Institute of Electrical Engineers will be held at White Sulphur Springs, W. Va., June 29, to July 2, 1920. A large number of important technical papers will be presented during the meeting and opportunity will be furnished for participation in seasonal sports.

British Automatic Telephones.

Theodore Gary & Co., of Kansas City, Mo., owners of the Automatic Electric Company, Chicago, and of the International Sales and Engineering Corporation of New York, have purchased the International Automatic Telephone Co., Ltd., of London, Eng., and propose to engage in selling and installing automatic telephone equipment throughout the world.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL.

F. H. FAY, supervisor of printing telegraph service, American Telephone and Telegraph Co., New York, has received from the French government the citation of *Chevalier du Merite Agricole*. During the war he was a major on the staff of Brigadier General Edgar Russel, Chief Signal Officer of the American Expeditionary Forces in France. After the armistice Major Fay served on the staff of Herbert Hoover as officer in charge of communications.

ERNEST C. CARR, of the engineering department, American Telephone and Telegraph Company, Chicago, was a New York visitor on May 13 and 14.

H. M. TURNER, professor in charge of the Communication Laboratories. Sheffield Scientific School, Yale University, New Haven, Conn., accompanied a group of the school's engineering students on a trip of investigation to various engineering establishments in New York and vicinity during the week of May 16.

C. O. VAN DER VORT, before the war, telegraph and telephone engineer in the service of the Michigan Central Railroad, and during the war in military service in France, is now in the service of the Western Electric Company at East Orange, N. J.

JAMES UNCLES, at one time expert telegrapher in the service of the Associated Press, and later manufacturer of keyboard telegraph transmitters, is now sales engineer for the National Printers Specialties Company, New York.

EDWARD BLAKENY, for many years in the engineering departments of the American Telephone and Telegraph Company, and the Western Union Telegraph Company, is now a member of the technical staff of the research department, Radio Corporation of America, New York.

ROBERT H. MORRIS, at one time wire chief in the New York office, and later in the engineering department of the Western Union Telegraph Company, was a New York visitor on May 19. Mr. Morris is now living in retirement at Roselle, N. J. He is the inventor of the widely used Morris duplex system, which requires battery at one end of the circuit only.

POSTAL TELEGRAPH-CABLE COMPANY.

EDWARD REYNOLDS, vice president and general manager, returned to his office Monday, May 24th. after completing a trip through the Western and Pacific Divisions, and the state of Texas. He was well satisfied with the conditions found at all points visited. All offices are showing a very gratifying increase in gross business and the service is well maintained everywhere. Mr. Reynolds gave particular attention to the personnel of the staff in all the places visited, and to the wage problem, and from his first-hand knowledge of conditions through out the system is well satisfied with the business outlook and that the Postal Company is in position to face the future with the utmost confidence. Whatever may be said of the labor situation among other public service corporations, Mr. Reynolds says there is no unrest or dissatisfaction to be found in the Postal ranks and that the so-called "Postal spirit" is in evidence everywhere. The employees are delighted to be again working under private management and are taking a keen interest in the success of the company. In the course of his travels Mr. Reynolds visited forty-eight different cities and all of the branch offices in those cities, and covered the principal places in twenty-two states.

J. J. WHALEN, traffic manager, is completing a circuit of the principal relay offices of the system. He is now in the Southern Division and expects to reach his office by June 2.

J. P. O'DONOHUE, assistant chief engineer, is in the Mackay territory on a trip in connection with local office equipment.

R. GOULD, of the plant department, recently left New York to cover some of the important lines in the eastern territory.

MANAGERS APPOINTED: J. E. Roberson, Wilson, N. C.; C. L. Seastrunk, Aiken, S. C.; Miriam Hardin, Newton, Miss.; W. W. Dover, Gadsden, Ala.; D. H. Booth, Greenwood, S. C.; E. H. Thomas, Mason City, La.; G. W. W. Reid, Branchville, S. C.; J. P. McCloskey, Salisbury, Md.; J. C. Crowley. New Bedford, Mass.; A. T. Montgomery, Malone, N. Y., and B. S. McClane, Greenwood, Miss.

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New York Operating Department.

ELSIE SEIFERT, assigned to the First Philadelphia bonus circuit, has resigned to join the matrimony club. The groom is Walter Greene, who handles the First Pacific circuit at the cable office, 20 Broad Street.

E. A. CONEY, assistant day manager and E. J. Rankin, night manager, are enjoying an early vacation which they are spending in Jersey.

W. M. WOLF, of the First Chicago bonus circuit, has returned to duty after an illness of three weeks, and is again moving traffic at high speed.

THE FOLLOWING assistant chiefs have returned from their vacations: T. P. Brooks, R. F. Stewart, and C. P. West.

R. M. TELSCHOW, quadruplex chief, is spending his annual vacation at his farm in New Jersey.

Philadelphia, Pa., Notes.

THE ANNUAL MEETING of the Mutual Investment Association of Postal Telegraph employees was held in Philadelphia, on the afternoon of May 17th. All of the officers were re-elected; they include J. J. Hardy, treasurer; J. H. Wilson, secretary and the following as members of the finance committee: C. E. Bagley, chairman, R. C. Mecready, P. J. Reilly and J. A. Vogt.

AMONG RECENT PHILADELPHIA visitors were managers T. P. Dowd, of Washington, D. C., J. A. Vogt, Baltimore, C. E. Diehl, Harrisburg, and T. B. Riley, Shenandoah, Pa.

F. V. GREENE, stationman at Sunnyburn, Pa., who has been on the sick list for some time, is now recovering and expects to be back at his station in the near future.

MISS E. G. COLLINS has been appointed branch manager at the Hotel Traymore, Atlantic City, N. J., and Miss Rose Swarth, manager of the new branch at the Breakers.

Dot and Dash Club, Philadelphia.

The Dot and Dash Club of Philadelphia held its Spring dinner on May 17 at the Hotel Hanover, Philadelphia. One hundred and twenty-five guests were present and the affair proved a big success. President C. E. Bagley acted as toastmaster, and short addresses were made by Dennis F. Brown, Washington, D. C.; George S. Bliss, chief of the Weather Bureau, Philadelphia; John W. Kelly, chief of the Electrical Bureau, Camden, N. J.; Clark E. Diehl, Harrisburg, Pa., and J. Milton Connell, Philadelphia. A vaudeville entertainment wound up the evening's fun, in which were featured the American Telephone and Telegraph Co. quartette, the Western Union quartette, Francis D. Bourke and William Hardman, of the Postal, J. Milton Connell and several singing and dancing acts.

Boston, Mass., Postal.

P. VITALE, of the branch office at 38 Broad Street, will act as manager at Bar Harbor, Maine, during the summer season. Mrs. Brewer will serve as operator at that point.

OMEY CREWE READE, superintendent of the Commercial Pacific Cable Company, Hong Kong, China, was a recent visitor in Boston. Mr. Reade drops in upon us about once every five years.

MISS CLAIR, manager of the Roxbury branch, is expected to resume her duties shortly. She has been suffering from serious eye trouble. Mrs. Bresnaham has been handling the office during Miss Clair's absence.

ISABEL WILLIAMS has been appointed stenographer to manager McDonald.

J. H. MAYER, of division engineer Gage's staff has completed the installation of a new motor generator and additional quartette table at Worcester, Mass.

Buffalo, N. Y., Postal.

THE FOLLOWING APPOINTMENTS have taken place in the Fifth District:

Max Lieberman, operator, and Alice Klauck file clerk, at Buffalo; C. E. Carmody, operator, Jos. B. Perry, night delivery clerk, Olive E. Finch, receiving clerk, Winona C. Fisher, and Agnes H. Griffin, telephone clerks, at Rochester, N. Y.; Carrie Holden, telephone clerk, Frances Detor, check clerk, Mrs. S. Dakin, Helen Palmer and Ella Jones, clerks at Syracuse, N. Y.; George Pyne, operator at Auburn, N. Y., and Mildred Aldrich, clerk, at Cortland, N. Y.

Pittsburg, Pa., Postal.

THE BRANCH OFFICE at 959 Liberty Ave. has been moved to a new location in the Seventh Avenue Hotel, with Mrs. E. Y. Ouderkirk in charge as manager.

THE BRANCH OFFICE at 405 Federal St. has been moved to 307 Federal St., with Irene Jones in charge as manager.

H. D. ROBINSON has been appointed manager at New Castle, Pa., vice Blanche Marland transferred to Butler, Pa., as manager.

MARGARET STAPLETON, formerly manager at Butler, Pa., has been transferred to the Sharon, Pa., office.

SUPERINTENDENT H. SCRIVENS has returned from a trip of inspection to offices at Altoona, Franklin, and Oil City, Pa., and Cumberland, Md.

Chicago, Ill., Postal.

CHARLES M. BAKER, general superintendent of plant, has returned from an official trip which in-

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cluded St. Louis, Mo., Tulsa, and Oklahoma City, Okla., and vicinity.

S. W WINEBRINNER, heretofore manager at Frankfort, Ky., has been transferred to Muncie, Ind., as manager.

C. E. RICE, recently of New Albany, Ind., has been appointed manager at Frankfort, Ky.

C. B. COURTRIGHT, manager at Cedar Rapids, Ia., has resigned to take up farming. He is succeeded by G. A. Clemens, formerly manager at Moline, Ills.

H. MCDANIELS has been appointed manager at Muskegon, Mich. He has heretofore been employed in the Chicago office as operator.

JOSEPHINE DESOURDY has been appointed manager of the office at Holland, Mich.

G. D. HORTON has been appointed chief operator at Grand Rapids, Mich.

C. F. CRITTENDEN, manager at Detroit, Mich., has returned to duty after a spell of sickness.

MISS I. E. BURKE has been appointed manager of the office at Charlotte, Mich.

L. S. HOCKENDONER has been appointed manager of the office at Ottawa, Ills.

MISS JESSIE PHELPS has been appointed manager at Elgin, Ills., vice Miss Miller resigned on account of the illness of her mother.

EDGAR W. COLLINS, general superintendent, recently mailed to TELEGRAPH AND TELEPHONE AGE his check to cover subscription to the magazine for the coming year. Mr. Collins has done the same thing annually during the past thirty-seven years, and in this time has not failed to receive, and read, a single issue of the journal.

Postal, Pacific Division.

THE VISIT of General Manager Edward Reynolds and Traffic Manager J. J. Whalen, in San Francisco during the first week of May, gave members of the local staff an opportunity to gain a first hand acquaintance with the New York executives. Messrs. Reynolds and Whalen, after leaving San Francisco made official calls at Portland, Ore., Seattle, Wash., Reno, Nev., Spokane, Wash., Helena, Mont., Great Falls, Mont., Butte, Mont., and Salt Lake City, Utah, all of which offices are in the Pacific Division.

FRANK ARNSBERGER, wire chief, is away on his annual vacation.

H. LING has been promoted from night monitor chief to quadruplex chief operator. Mr. Ling was formerly with the Western Union at Tonopah, Nev., and is one of our most promising employees.

R. F. SHELLEY, recently in the quadruplex department, has gone to Montana to look after mining enterprises in which he is interested.

H. BENNETT, formerly at Butte, Mont., has been appointed night chief operator at Salt Lake City, Utah.

A. S. KIMES, in the telegraph service of a brokerage company during day hours, works extra during the evening in the main office, San Francisco.

N. F. HARRISON, quadruplex chief, nights, has been on a week's vacation. His son, Newton Harrison, who has been in the service of the Commercial Cable Company at Guam and Midway for several years is on a furlough in San Francisco at the present time.

B. W. FIELDS, division engineer, has in hand the installation of additional repeaters at Fresno, Calif., and the work of enlarging the main operating room at San Francisco.

H. J. THOMPSON, chief operator of the Los Angeles office was a recent San Francisco visitor.

P. A. ANGUS has been advanced from night chief operator to day traffic chief at Los Angeles. S. B. Runyan takes the position vacated by Mr. Angus.

SOL ELBERG, for many years division cashier and chief clerk to the superintendent at San Francisco, has resigned from the service to take up work in another line.

Portland, Ore., Postal.

THE STAFF at this office consists of John Annand, manager; Frank J. Shubert, chief operator; Alex Ellis, night chief operator; L. C. Auld, late night chief operator; Mrs. L. E. Durkee, cashier, and the following operators—all first-class men: Frank E. Deparcq, W. J. Malloy, R. F. E. Wendeborn, Mrs. L. I. Dolphin, Larry Connell, E. A. McCann, R. W. Curtis, J. V. Reid, D. W. Kelly and B. V. Hicks.

Recent official visitors in Portland included: Edward Reynolds, general manager, and J. J. Whalen, traffic manager, New York; H. E. Patton, district superintendent, Seattle, and J. J. Lynch, superintendent of construction, San Francisco.

ROGER FISON, for many years in the service of the Associated Press as operator, and later as division editor, and who for a time was advertising manager for TELEGRAPH AND TELEPHONE AGE, is now Eastern manager for the *Electrical Review*, with offices in New York.

ELIAS T. CRUZ, of the Bureau of Posts and Telegraphs, Manila, P. I., is now in New York, where he is to remain until about the end of the year, familiarizing himself with American methods of handling telegraph and telephone traffic.

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WESTERN UNION TELEGRAPH COMPANY.

R. E. CHETWOOD, plant engineer, has returned from an inspection trip to terminal offices in the Lake, Mountain and Pacific Divisions.

S. R. CROWDER, office layout engineer, has returned from a business trip to San Francisco.

W. H. BELL, of the Richmond, Va., office has been appointed chief operator of the Chester, S. C., office recently opened as a repeater station.

E. W. PITTMAN, assistant chief operator at New Orleans, La., has been appointed chief operator at Little Rock, Ark., vice T. J. Richmond, granted leave of absence.

SAMUEL D. SWEAT, formerly wire chief at Savannah, Ga., has been transferred to the division office at Atlanta, Ga., as traffic inspector.

GEORGE C. HENNING, of the Denver, Colo., office has been transferred to Fort Madison, Iowa, as chief operator.

W. A. PORTEOUS, manager at New Orleans, has been assigned to special duties by the company, and will shortly make a tour of the larger cities and towns in the interest of the service.

THE FIRST ANNUAL GAMBOL of the Western Union Bowling Association, of New York, will be held at Mungers on the Beach, Newdorp, S. I., on Saturday afternoon and evening, June 5, 1920. The entertainment will consist of a shore dinner, athletic sports and dancing.

RECENT executive office visitors included C. A. Plumly, superintendent of telegraph, Baltimore and Ohio Railroad, and George A. Cellar, general superintendent of telegraph, Pennsylvania system.

A. C. MCCONNELL, secretary and auditor of the Great North Western Telegraph Company, Toronto, Ont., was a New York official visitor recently.

Western Union Telegraph Company Employees' Income Participation Plan.

The following announcement has been made to the employees of the company's land line system:

1. After many conferences between the company and the Association Western Union Employees, the following income participation plan is announced for the year 1920 only.

2. This income participation plan is essentially experimental, and its effect upon stabilizing the force, promoting economy, increasing efficiency, and improving the quality of the service will be on trial. If it does not accomplish these things it is of no permanent value either to the employees or to the company.

3. If the experiment is a success then, with the knowledge and experience gained through the operation of this experimental plan, the company and the Association Western Union Employees will be in a better position further to consider the subject.

4. The plan shall include the business of both the land line and cable systems.

5. The management of the company and of its property shall remain vested in the board of directors, as heretofore.

6. The method of keeping the accounts is prescribed by and subject to the Interstate Commerce Commission.

7. For the purposes of this plan the divisible income shall be, for the year 1920, the sum remaining after deducting $10,000,000 from the company's net income, and after allowing for reserves for depreciation, etc., and the payment of all fixed charges including taxes, interest and rentals.

8. One-half of this divisible income, as above defined, shall be paid as additional compensation to employees qualifying under this plan, as hereinafter stated.

9. All regular employees continuously in the service from and including January 2, 1919, and who continue in the service, without break, except those hereinafter provided for, until August 1, 1920, and February 1, 1921, respectively, shall participate in the first and second payments to be made about August 15, 1920, and February 21, 1921.

10. All regular employees continuously in the service from and including July 1, 1919, and who continue in the service, without break, except those hereinafter provided for, until February 1, 1921, shall participate in the second payment to be made about February 21, 1921.

11. All regular employees who have served either in the military or naval branches of their respective governments and who, exclusive of the period of furlough, have the required unbroken or continuous length of service, shall participate in either or both payments, as the case may be.

12. Commission and "other employment" employees, messengers and joint railroad employees shall not participate in either payment.

Indianapolis, Ind., Western Union.

L. R. SCHOLL, city superintendent, Cincinnati, was a recent Indianapolis visitor.

J. J. WELCH, division traffic superintendent, Chicago, was an official visitor in Indianapolis on April 26.

JOHN F. WALLICK, formerly superintendent, and now retired, was present at a recent manager's meeting in Indianapolis and met many of his former business associates. Mr. Wallick is now in his ninety-first year.

J. F. MORGAN, representing the contract department, general manager's office, was in Indianapolis on May 5 to attend a meeting of the Indiana Public Service Commission.

C. W. STEINHAUER, chief operator, was a business visitor at the general offices, Chicago, recently.

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THE ASSOCIATION WESTERN UNION EMPLOYEES gave an entertainment in the Ball Room of the Severin Hotel on April 30. About 200 members attended.

A CONFERENCE was held at the Severin Hotel during the week of April 26, attended by A. C. Kaufman, general commercial agent, New York, and the following Lake Division officials: A. C. Cronkhite, general manager; C. J. Eldridge, division commercial agent; E. Boenig, district commercial superintendent; A. A. Brown, city superintendent, Indianapolis; J. H. Malloy, district commercial agent, R. H. Underwood, commercial agent; W. M. Fryer, and A. W. Wellington, district commercial managers, and managers J. P. Freeman of Fort Wayne, Ind.; P. L. Mounce of Evansville, Ind.; H. Hassinger of Terre Haute, Ind., as well as managers from other Indiana offices.

V. O. ELKINS, formerly manager at New Albany, Ind., has been transferred to the traffic department at Indianapolis, Ind.

BUSINESS DEVELOPMENT MEETINGS were held in Cincinnati, April 19 to 23, inclusive, and in Cleveland May 4 to 7. In addition to those present at the Indianapolis conference, and who attended the Cincinnati and Cleveland meetings, the following officials attended the Cleveland conference: Superintendent Montgomery, District Commercial Agent Bowen, Division Auditor Sprague, and Traffic Supervisors Springer and Combs.

CLYDE OSBORNE has been appointed manager of the office at Tell City, Ind.

MRS. M. G. SIBLEY has been appointed manager at Portland, Ind.

Oklahoma City, Okla., Western Union.

R. L. KELLY and J. N. BLAIR, of the Morse department, have been transferred to the Fort Worth, Tex., office.

R. T. JONES and H. L. GRIFFIN have been granted leave of absence.

R. F. SYKES, of this office, is relieving operator at Enid, Okla., who is on vacation.

W. A. PHILLIPS has been transferred to Fort Worth, Tex.

T. G. MEADOR is spending his annual vacation at Russell, Kan.

C. B. SLOOP and MRS. C. B. SLOOP now are members of the Morse staff in this office.

RUSSELL HARDY has resigned to join the ball club at Minneapolis.

CONFERENCES are held each month between the Board of Directors of the Association Western Union Employees, at which the manager and chief operator are present for the purpose of discussion of working conditions and other matters pertaining to the benefit of the service.

Bruce Ross Allen, Division Commercial Manager, Lake Division, Western Union Telegraph Company.

Mr. Allen was born at Newport, Ky., twenty-nine years ago, and received his early education in the grade and high schools of Cincinnati, Ohio. He entered the service of the Western Union Company in October, 1910, as office boy for I. N. Miller, superintendent at Cincinnati, remaining in that office until August 30, 1918, at which time he had attained to the position of assistant chief clerk. On the latter date he entered military service, and

B. R. ALLEN.

within five months was promoted to first sergeant of his company.

In March, 1919, he was mustered out of the national service and was placed in the general manager's office, Chicago, as general clerk, being detailed to special duties.

Mr. Allen's appointment to the position of division commercial manager places on the staff the youngest man in the Lake Division to occupy an official position. He will be in charge of messenger organization and development.

STERLING MORTON, president of the Morkrum Company, was in New York ten days following May 10. While here he conducted demonstrations to the leading telephone and telegraph companies of the Teletype, the latest development of the Morkrum Company. Mr. Morton reports a great deal of interest in this small, simple printer, which seems destined to fill a long felt want.

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RADIO TELEGRAPHY.

THE *Imperator,* of the Cunard Line, arrived from Liverpood recently and reported that throughout the entire trip across the Atlantic she had been in communication with the radio station at Aberdeen, Scotland. This is said to have been the first time a vessel has been in communication with a single land station on an entire transatlantic trip.

CUTTING and WASHINGTON, radio engineers and manufacturers of radio apparatus, are reported to have under way the construction of a long distance radio station at a point near the eastern end of Long Island.

EMIL J. SIMON, radio engineer, New York, and an official of the Radio Communication Company, is reported to be engaged in organizing an Inter-City radio telegraph service, contemplating the establishment of overland commercial telegraph service.

World's Largest Wireless Station.

The Radio Corporation of America has purchased a tract of 6,000 acres at Rocky Point, L. I., about seven miles from Port Jefferson, where it is planned to spend the sum of ten million dollars in erecting and equipping a new radio station which will be the largest in the world.

E. J. Nally, president of the Corporation, states that the station will have seventy-two sets of antennas radiating from a central station. The steel towers will be 400 feet high. The station will comprise five operating units—one for communication with Argentina, one with France, one with Scandinavia, one with Germany, and one with Italy and Poland.

Radio Service Between America and Scandinavia.

On May 15, the Radio Corporation of America inaugurated commercial service between the American stations at Marion and Chatham, Mass., and the stations at Stavanger and Naerobe, Norway. These four stations constitute a sending and a receiving terminal in the respective countries, permitting high speed duplex operation. The rates from New York are: to Norway, 24 cents; to Sweden, 26 cents; to Denmark, 28 cents, and to Finland 29 cents per word.

Proposed British Empire Wireless Chain.

A proposal to form a chain of wireless stations to link up all parts of the British Empire has been put forward by the Marconi Wireless Co. The plan provides for the erection of stations in England, Egypt, India, East Africa, Canada, South Africa, West Indies, West Africa, Straits Settlements, and Australia.

To secure a monopoly of such a service, the company is reported to offer:

1. To construct, maintain, and operate the system.
2. To pay 25 per cent of the net profits of each station to the governments concerned.
3. To concede the right of nationalization on a basis of cost, plus 10 per cent of the gross receipts for a period of 30 years.

In return the company makes the following demands:

1. All requisite licenses for a period of 30 years.
2. Compulsory acquisition of sites.
3. Control except in national emergency.
4. The right to extend the system to foreign countries, provided imperial shall have precedence over foreign traffic.
5. Protection of routes from interference by other companies.

Radio Talks to Boy Scouts.

Messages from the national council of the Boy Scouts of America to its 400 local councils and 18,000 troops in all parts of the country are being sent out from New York every day by the local navy radio station. This has been made possible by an order from Secretary Daniels which is predicated upon the navy's appreciation of the war service of the radio operators, who learned wireless telegraphy when they were Scouts.

Amateur operators throughout the country receive some interesting bits of information for boys every evening at 9:30 o'clock (Eastern standard time) from N A H, as the local station is known. These messages are sent out at slow speed, which makes it possible for the home-made set to receive without trouble. Acknowledgments of the receipt of the messages have been received from forty-two states, including all of those on the Pacific Coast.

Radio Club of America.

The May meeting of the Radio Club of America was held at Columbia University, New York, on May 28. Messrs. E. V. Amy, George E. Burghard, and Lester Spangerburg exhibited and described the construction of vacuum tube transmitters for radio telegraphy and radio telephony.

Bell Telephone Company of Canada.

The Bell Telephone Company of Canada has been granted permission by the Railway Commission of the House of Commons to increase its capital stock from $30,000,000 to $75,000,000.

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Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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BACK NUMBERS of this journal three or more months old will be charged for at the rate of 25 cents per copy.

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Systems of Telegraph Operation in America.

In the management of telegraph companies we have in the United States to-day a situation which is making interesting telegraph history.

The Western Union Telegraph Company is now handling above seventy-five per cent of its trunk wire traffic by means of printing telegraph systems while the opposition company, the Postal Telegraph-Cable Company Company, relies entirely upon Morse transmission over single, duplex, and quadruplex circuits.

Both companies are doing a very large business. Within the past few years telegraph message traffic has grown into figures which fifteen years ago were thought likely never to be reached in view of the rapid growth of the telephone business.

When the subject "Printers versus Morse" is discussed each company seems able to make out a good case justifying its adopted course. The Western Union Company has shown that had it not been for the printing system it would have been next to impossible for it to have handled the large traffic which immediately followed the entry of our country into the late war. The needs of war took away a considerable number of the men operators and it was possible to quickly train young women to take their places at the wires when printers are used in place of Morse transmission. Further, the company has shown that to have handled the traffic by means of Morse duplexes would have necessitated the building of many additional main line circuits between important centers. Obviously, during the war period, this was not practical. The fact that the termination of the war did not result in material reduction of telegraph traffic continued the conditions with the exception that the building of additional wires once more became possible. However, the high cost of materials and of labor prevailing in the post-war period compared with the same costs of pre-war days made it desirable to increase to the greatest degree the number of messages a single wire carried simultaneously, so that the erection of additional line wires might be postponed or avoided altogether.

The Postal Telegraph-Cable Company, on the other hand, moves all of its large traffic by means of high speed manual duplexes. By "high speed" is meant, simply, the assigning of expert Morse operators to important circuits, the operators using semi-automatic transmitters which enable them to handle individually from seventy to one hundred messages per hour. On a duplexed circuit this means from 140 to 200 messages per wire per hour. Where quadruplexes are operative the traffic per wire is increased perhaps one-third.

During the past year the company has erected many thousands of miles of additional main line wire and an extensive construction program is still under way. New circuits erected are being so strung that they may be used for commercial telephone purposes, while at the same time serving as telegraph message circuits.

It is rather a unique situation that the Postal Company has no printers in service. The company pioneered with several printing telegraph inventions and, after service trials of varying lengths abandoned their use. In 1907 the company equipped a number of its important trunk circuits with the Rowland system. In 1908 the Wright duplex printer was given a thorough service test, continuing a year or two. In 1910 the first commercial installation of the Morkrum printer was on a New York-Boston circuit of the Postal Company, and during the following eight years Morkrum equipment was installed on a dozen or more important circuits, but a year and a half ago all were replaced by Morse equipment.

The Morkrum system is widely used in Western Union, railroad, Great North Western Telegraph Company, and Canadian Pacific telegraph services.

The Morse telegrapher is supreme in the Postal Telegraph-Cable Company's service to-day, and while the present situation lasts, in rendering good telegraph service he is competing with machines which are remarkably dependable and which never tire out.

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A TRIP WITH A RADIO MAN ACROSS THE ATLANTIC

By John Dunsheath.

No farther back than twenty years ago, when a vessel left an American port destined for a port across the Atlantic, handkerchiefs waved by departing friends or relatives were visible perhaps fifteen or twenty minutes after the ship left her moorings at the dock. From that time forward those on board were completely out of touch with terra firma—and with friends securely living thereon until a week or so later waving handkerchiefs on an English, Irish, or French dock again established friendly intercourse with persons on shore.

At the present time practically every ship that sails the seas is equipped with radio telegraph apparatus and has on board one or more radio operators whose business it is to maintain communication with land stations on either side of the ocean and with other ships passing east or west.

The traveler at sea no longer is isolated *incommunicado* with those left behind. No longer must he read the daily newspapers for a week or two in arrears after crossing the ocean in order to catch up with the trend of political, commercial or social affairs; for, on shipboard in these days a newspaper is issued two or three times daily which contains all of the up-to-the-minute news, received by wireless.

Within the past ten years there has developed into fullness a profession as attractive and interesting as was the profession of a Morse telegrapher when the railroads and telegraph lines throughout the Western States were being built. Morse operators of the early days were the wonder workers of their times. The frontier telegraph office ever was the center of a district's activities—opportunities in plenty for romance, adventure and unusual experience were the operator's portion, and although in Alaska and in some sections of the west similar conditions exist to-day, the land-line telegraph business has, in the main, settled down to a steady going, everyday sort of occupation.

From the Prairies to the Seas.

The scenes of youthful adventure have shifted from the prairies to the seas, and one who has the opportunity to mix with and converse with sea-going radio operators who make New York their headquarters will soon sense the fact that the hundreds of young men now engaged in ship radio work possess marked characteristics identifying them as the descendants of the adventurous spirits who many years ago departed from the green valleys of the East to seek adventure on the deserts of the West.

The radio operator who remains in the business even for a period of four or five years has presented to him ample opportunity to explore the larger cities in Europe, Asia, Africa and South America—his range of observation extends over the entire world. The Morse telegrapher of thirty years ago knew Cheyenne, Ogden, Goldfield, San Antonio and New Orleans as he knew his own back yard down East. The radio telegrapher of to-day knows Buenos Aires, Cairo, Hong Kong, Cape Town and Copenhagen well enough to tell many a tale of strange adventure participated in in these remotely separated cities.

The radio amateur who has not had any sea service, but who has in operation a set of radio apparatus with which he picks up messages and aerial conversations from far and near, often wonders what stations the radio operator on shipboard hears or communicates with from the time he sails from New York to a foreign port until he returns. In what follows the writer will give a brief outline of his experience in this regard on a recent trip from New York to Copenhagen, Denmark, and return.

New York and Vicinity Stations Heard at Sea.

During the first one hundred miles outward from New York, the radio operator who has a standard crystal receiving set and ordinary ship's aerial, hears practically all of the New York stations and stations in that vicinity—even the amateurs are heard fairly well at night. After the one hundred mile point is passed Brooklyn Navy Yard (NAH) and the Bush Terminal station (WCG) are still loud and plain. The Radio Communication Company's station (WHB) is readable through other traffic. At 125 miles NAH, WCG and the other stations fade out and can be read only with difficulty, but the Navy station (NAF) at Newport, R. I., comes in strong.

From Ambrose Channel, outside of New York, to beyond 100 miles therefrom, the Navy station at Cape May (NSD) is fairly bright, and the Navy's Boston station (NAD) may be read plainly if New York stations are not interfering seriously. The Cape May station is easily tuned to selectivity if there are no nearby overpowering signals being transmitted. The Bush Terminal station (WCG) of the International Radio Telegraph Company also is easily read through other traffic, as the note is high and clear.

At a point about 200 miles from New York, Cape May (NSD), and the International Radio Telegraph Company's stations at New London, Conn., (WLC) and at Newport, R. I., (WCI) are fairly strong and readable, continuing so until the ship has reached a point about 350 miles from New York. At 400 miles out Bar Harbor, Me., (NBD) is the station whose signals are loud enough to be recog-

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izable, and at 500 miles Cape May (NSD) is gain heard. At this point the Newfoundland station at Cape Race (VCE) comes in, also the station t Cape Sable off the coast of Nova Scotia (VCT). he last American stations heard are at about 700 iles out of New York. These are Bar Harbor NBD), Cape May (NSD) and Boston (NAD).

It should be understood, of course, that although o mention is made of signals passing between the igh-power stations of the Radio Corporation of merica (Marconi Company) in New Jersey and n Massachusetts, these stations are continuously andling regular traffic all the way across the Atlanc, but on very long wave lengths, and are not eard on ordinary ship's sets.

During the trip across the Atlantic the operator n a ship can hear other ships receiving radiograms rom land stations, and there is a certain amount of affic between passing ships, and ships from 100 to 00 miles apart on the ocean, the distance covered eing generally dependent upon the range of the ip's transmitting outfit.

After the American land stations are no longer be heard on the eastward journey it is not long efore British and French land stations are audible n shipboard. For the purposes of the present little ory, however, it may be best to record the signalg ranges of the European stations as they are bserved on the return trip.

On the return trip from Denmark the station at laabandshook, Denmark, (OXB) may be heard alf way down the English channel. The station Cullercoats on the border of England and Scotnd (GCC) is picked up in the channel; and then, order, Dover, North Foreland, Niton, and Land's nd—the latter four along the south coast of Engnd. Also, while the ship is passing through the annel and into the Atlantic, the Holland station PCH), Belgian station (OST), and the French iffel Tower station (FL), and Ushant (FFU) e heard in operation.

The English station at Land's End (GLD) is eard at a distance of 650 miles from shore; shant, France, station, at a distance of 750 miles, d the Poldhu, England, station (MPD) at a disnce of 1,600 miles from shore. The station at rookhaven, Ireland, is heard at a distance of 850 iles from shore. Shortly after Poldhu's signals e unreadable on the ship's set, Arlington (NAA) ear Washington, D. C., is picked up; then Cape ace (VCE), Bar Harbor, Me., (NBD), Cape ay, (NSD); and, finally, within 250 miles of ew York, Brooklyn Navy Yard—NAH, WCI, BD, and WSE are picked up in turn.

As the ship nears New York harbor she enters field where the radio traffic is very heavy and it remarkable the number of messages that are sent d received between ships and shore stations in an ea where so many stations are in operation. odern tuning gear makes it possible to adjust for rong signals to or from a desired station or ship. his, and the fact that the various stations employ fferent signaling tones gives the operator a ance to listen to calls from all stations and to dispatch his messages to any desired station so they may be delivered many hours before the ship reaches New York.

SERVICE SCHEDULES NEEDED.

It may be that the matter is now in hand by the radio authorities, but the operator who makes a transatlantic trip finds his work more exacting because at present there is apparently no set time for the transmission of information relating to weather, time, ice warnings, mine warnings, news dispatches, wavelength adjustment, and traffic calls from the various stations.

Service information of the classes enumerated is sent out by the following stations, but so far as the writer is aware there is no schedule containing references to set hours of transmission: Poldhu, MPD; Cape Race, VCE; St. John, N. B., BZM; Cape Sable, VCT; Sable Island, VCS; Cape May, NSD; New London, WLC; Bar Harbor, NBD; Newport, WCI; New York, NAH, WCG and WHB; Arlington, NAA; Land's End, GLD; Crookhaven, GCK; Eiffel Tower, FL; the British Admiralty station at Whitehall, BYA; and the Norwegian station at Stavanger.

Poles Broken by Automobiles.

From all parts of the country is reported an increasing number of telegraph and telephone poles broken by automobiles. In many cases the driver or passengers are killed as a result of collision with poles, and in some instances escapes from death or serious injury on the part of those riding in the machines are by narrow margins.

Loaded Lines.

The transcontinental telephone lead passing across the State of Nevada has little to contend with in the way of rapidly growing foliage, or of falling trees, but W. K. Ballantine, repairman stationed at Elko, in that State, spends a considerable portion of his time shooting at large flocks of crows which perch on the wires occasionally. There is a limit to the number of crows a span of wire will support—from a telephone traffic standpoint.

The Telegraph in Guatemala.

During the year ending March 1, 1920, the telegraph traffic handled by the National system amounted to 1,523,512 telegrams, or 6,149 more than during the previous year. The telegraph lines at present cover 7,279 kilometers, 114 kilometers having been added during the year 1919. The telephone system covers 672 kilometers. There are 262 telegraph offices and 252 telephone offices in the country.

IN COLOMBIA, SOUTH AMERICA, the municipality of Girardot is calling for bids for a telephone system, contract to be awarded on August 1, 1920.

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser."

(Continued from June 1 issue.)

Design, Construction and Speed.

The most important factor to be dealt with is the *speed of operation,* and this factor governs the manufacturers' specifications for the cable.

The speed factor is generally known among cable engineers as the *KR.*

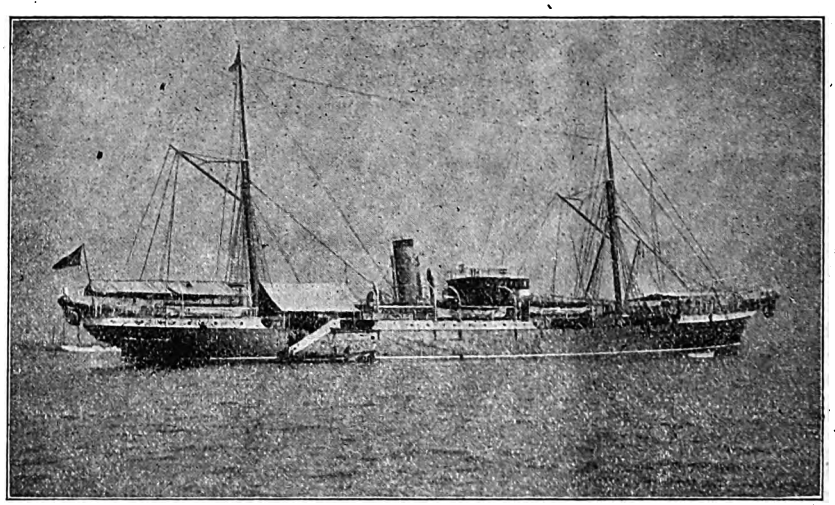
This value is arrived at by multiplying the total capacity in microfarads by the total resistance in ohms, and as this figure is generally up in the millions the product so obtained is divided by one million and the quotient and its fraction, if any, is then expressed as the *KR* of the cable. For example: take two cables each 1,200 knots long, resistance and capacity of one cable being 3,600 ohms and 360 microfarads, and resistance and capacity of the other being 7,200 ohms and 180 microfarads. The *KR* of each cable is the same; viz.: 1.296 *KR,* and according to theory both cables should work at the same speed.

It will be obvious from this that if the length of either cable were doubled the speed would fall just one quarter, and now it will be plainly seen why it is so necessary to span the ocean at the shortest distances possible.

The comparison of speeds is generally reckoned in "letters per minute" and is taken to be 3.7 units of space, or center holes per letter. This is generally abbreviated to lpm.

Of course different types of cable give different effects on the shape of the received signals. For example, a cable of high resistance and low capacity has a damping effect on the recorder coil, in which case it is generally necessary to work with a tight suspension so that the siphon will return to zero promptly.

The factor for the highest speed obtained on a cable varies, in the opinion of engineers, and the cable is limited as regards voltage for signaling battery. It is not wise to exceed fifty volts on the Atlantic sections, as higher voltages are liable to injure the insulation. It is supposed that the original Atlantic cable was put out of commission by excessive signaling battery. Contrary to this, however, one expert cable engineer is of the opinion that double the voltage of present signaling currents could be used without being detrimental to the cable.



Cable Ship "Mackay-Bennett."

Speed also depends on the size and character of the signals needed and instrument used. One thing is sure, that is, a cable operator should not be called upon to transmit doubtful signals, as the result is bound to cause errors in the traffic, and cable operators are not, as a rule, all expert slip readers. It is, therefore, necessary to keep well within the range of the average operator's capabilities.

A general rule followed for speed constant is that if the *KR* multipled by the number of letters transmitted amounts to 600 or over the cable is said to be worked to an average speed. This figure, however, varies considerably in practice, from 600 to 900, depending on conditions before mentioned and obviously the higher the speed constant the more efficiently the cable may be operated.

It is further obvious that the higher the speed the less the time duration of signaling contact.

It is possible to construct a cable to fulfill certain

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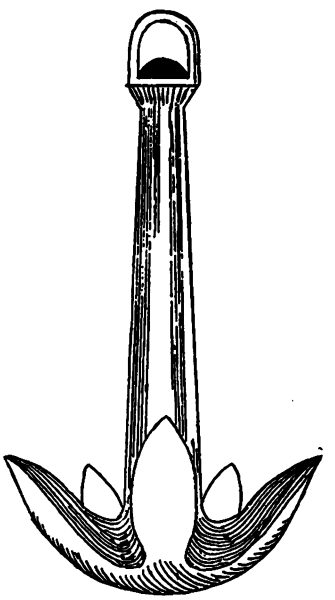
speed specifications, although the *KR* figure is not sufficiently informative to determine the dimensions of the core as will be readily seen from the above. The resistance of the core can be decreased by increasing the weight of copper, but the drawback in this means more capacity and a greater amount of gutta-percha to cover the conductor, and if this insulating coating is to have sufficient mechanical strength it will make such a cable a very expensive proposition. Gutta-percha is the ideal insulation for submarine cables. No substitute has yet been used successfully. Rubber has been suggested, but manufacturers have not had much success with it. The costs of gutta-percha and copper are about the same.



GRAPNEL.

If the *KR* of the cable is known in addition to any one of the following factors, the others can be found and all involved factors worked out therefrom:

1. Minimum resistance of dielectric.
2. Maximum weight or minimum resistance of copper.
3 The minimum thickness of dielectric.
4. The weight ratio of copper and gutta-percha.

The resistance of the cable before being laid, and after, varies according to the temperature which exists at the bottom of the sea. The pressure of sea water also causes the insulation to increase.

The cable is generally composed of a conductor of stranded copper wires over which is deposited the gutta-percha insulation, then the sewing of jute yarn over this, next the sheathing wires which are well galvanized and tarred, and outside of this layers of jute and compound.

The total weight in air averages one and one-half to two tons per knot but in seawater it is lighter and varies with the specific gravity and upon the ratio of its component parts. The cable sinks very slowly when being laid. Different types are used for different depths, the shore ends being of the heaviest types.

(To be continued.)

Communication Service Engineers in Chicago Organize.

In the latter part of May, telegraph, telephone and radio engineers located in Chicago and vicinity organized as a section of the Western Society of Engineers. At a meeting held, on May 24, 100 engineers were present.

The first officers elected are: Frank F. Fowle, chairman; Stanley R. Edwards, vice-chairman, and the following directors: Montford Morrison, Fred L. Baer, and M. A. Frye. Mr. Frye is an engineer in the traffic department, Western Union Telegraph Company.

During the months of July, August and September meetings are to be held on the first Tuesday of each month.

The organization of the communication engineers of Chicago as a Society unit is a step in the right direction and undoubtedly will result in bringing to the engineers engaged in wire and wireless services many professional advantages. We have pointed out several times during the past two years that the arts of telegraphy, telephony and radio are drawing together and that the time is rapidly approaching when an engineer engaged in any one of these lines of work must, in order to be up to date, keep step with the progress being made in the companion fields.

In New York the Telegraphy and Telephony Committee of the American Institute of Electrical Engineers has conducted a number of important gatherings of communication engineers at which from 400 to 600 men were present, and the monthly meetings of the Institute of Radio Engineers, held in New York, are attended by from 200 to 300 engineers, many of whom are regularly employed in land line telegraph, telephone, and submarine cable work. It is natural that the Chicago engineers should organize to develop similar opportunities for professional advancement. It would seem that there is a field for organizations of this kind in Boston, Pittsburg, Atlanta, Denver, Dallas, and San Francisco—possibly at other large centers.

THE OLD WIRE CHIEF SAYS: "In every judicial district in the country we should have a public official whose duties would be the opposite of those performed by the District Attorney. The District Attorney devotes all of his time to seeking out and prosecuting offenders against the law. The newspapers are filled daily with reports of his success. The new office here proposed would concern itself with seeking out and presenting for public commendation those who have never violated any legal or social regulation; who have never been in court, and who make unselfish contributions to the progress and welfare of humanity.

THE American Train Dispatchers' Association held its annual convention in New York on June 10.

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PRINTING TELEGRAPH SYSTEMS

JOHN H. BELL
Telegraph Engineer, Western Electric Company, New York

(Concluded from June 1 issue.)

OUTPUT

The introduction of printing telegraphs in place of Morse has not resulted in so great a percentage gain in operator output as has been achieved by the use of automatic machines in other fields of activity, nor can they ever be expected to do so. The human factor cannot be eliminated entirely; every message must be handled—letter by letter—by the sending operator, and be checked at the receiving end by the receiving operator.

The keyboard perforator, however, has been responsible for a considerable increase in speed of working at the sending end, while at the same time its operation involves less mental and physical fatigue on the part of the operator.

At the receiving end of a printing system, the operating duties are less exacting than those of the Morse operator. Although messages must be handled without delay the nature of the work permits of a freedom to the operator which cannot possibly be felt by Morse operators. Consequently, the operators are under less mental strain and can handle a larger volume of business.

It has been found that, in general, printing systems have shown some improvement over theMorse and Wheatstone systems, as regards labor economies.

The following statement, extracted from Mr. John Newlands' paper previously referred to, gives the comparative results of tests of various systems of telegraphy in England. As British messages average 24 words, while American messages average 30 words, I have equated the figures to American messages, as shown below:

System	Average per Operator Hour	
	British Messages	American Messages
Baudot Multiplex....	43	34.4
Wheatstone with Creed	35	28
Morse Sounder.....	31	24.8
Wheatstone	26	20.8

The Siemens and Halske, and American multiplex systems have been installed in the London office since Mr. Newlands' paper was written. No results have yet been published concerning these systems.

In the foregoing statement are shown the four systems of telegraphy by means of which probably 95 per cent of the British telegraph traffic is carried.

The Baudot multiplex shows an output per operator of 23 per cent greater than the high speed system—the Creed, despite the fact that the Baudot sending operators are limited to a maximum speed of 30 words per minute. Assuming an increase in output pro-rata with the increase in speed resulting from the use of the keyboard perforators and automatic transmitters, say 45 words per minute, the output per operator would be 64 British messages or 51.6 American messages per hour.

All these foregoing figures refer to team work on one or more circuits.

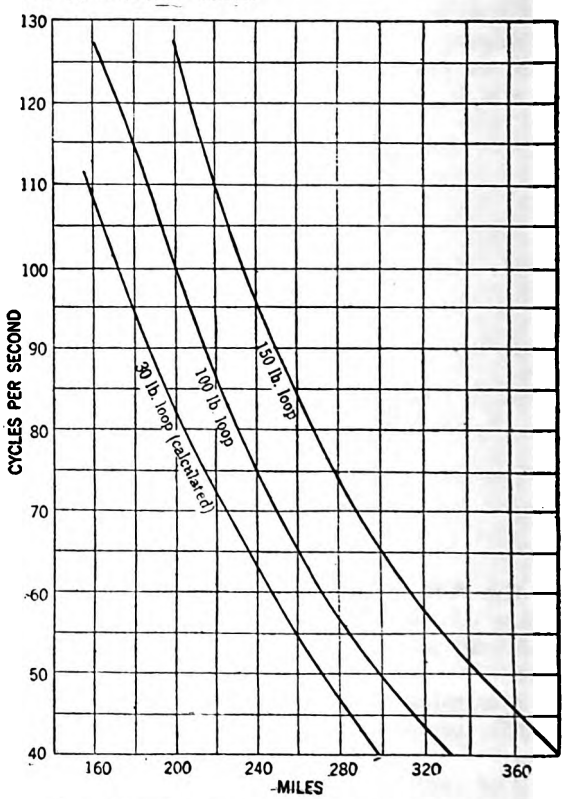

FIG. 37.—METALLIC LOOP CONDUCTORS

Curves showing relation between conductor weight mileage and speed of transmission.

In the 1919 April issue of the *Western Union News*, some interesting records of work done on keyboard perforating machines by women operators are given. From 100 to 130 messages per hour have been perforated by a number of operators for short periods, up to eight hours. For periods covering from one month to one year, the hourly averages, range between 60 to 79 messages.

In one particular case a woman operator maintained an average of 74 messages per hour for a period of eight hours during the first month after graduation from the training school.

In the same magazine is given data pertaining to record performances of Morse operators which

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ompare very favorably with the work of the key-oard perforator operators. In order to achieve uch results, however, it is necessary that the ope-ators at both ends of the circuit shall be experts whereas in automatic operation the transmitting perator output is not limited by the skill of the eceiving operator.

Maintenance.

Available information regarding the cost of maintaining installations of the various systems described is unfortunately too meagre to be of value n making direct comparisons.

Printing telegraph machines have not yet reached hat stage of perfection where they never get out f adjustment and never have broken parts. Consequently, provision should be made for the re-noval of faults due to such causes as promptly as ossible. What is even more important, however, s the provision of means for the detection of in-ipient faults before they have developed suffi-iently to interfere with operation and for the quick estoration of service when it has been interrupted y an apparatus fault. In this respect, the multi-lex systems are superior to the high speed systems. For a quadruple duplex installation, it is necessary o provide only one spare instrument of each kind, xcept the distributor. In the case of the American nultiplex system, such spare apparatus is mounted n a test table, which is provided with a small local listributor so that the machines may be tested in peration under conditions even more severe than n actual service. Spring clips are used for effect-ng the electrical connections on the operating and est tables and any machine can be removed and nother placed in its stead in a few seconds. If the est table is located in close proximity to the ope-ating tables, interruption to the flow of traffic due o machine trouble can therefore be almost entirely liminated. A fault in any of the machines, except he distributor, will stop the flow of traffic in one irection over one channel only. Faults in the dis-ributor are of rare occurrence. Generally a spare listribution face is available, and can be substituted n a few minutes.

In the case of high speed systems an apparatus ault in the transmitting or receiving apparatus auses total suspension of traffic flow in one direc-ion, and generally involves temporary interruption o the traffic in the other direction while the distant tation is being advised of the trouble.

The percentage of spare apparatus must obvious-y be greater than in the case of the multiplex sys-ems, except where four or more high speed instal-ations are in service in one office, and in such cases t is practically impossible to effect apparatus hanges so quickly as can be done with multiplex nachines. Where a complete spare set of machines s provided it is possible, of course, to switch over o the spare set without much delay.

One important factor in connection with the naintenance of apparatus is the periodical inspec-ion and overhaul. Such inspections reveal incipi-nt faults. The test table and local distributor of the American multiplex system are particularly valuable for this purpose, as the more severe conditions under which the machines can be tested will reveal small defects or faulty adjustments before such defects make themselves felt under normal working conditions.

For example, if a printer operates at 65 words per minute during one inspection test, and only 60 words per minute at the next, it is an indication that some slight fault exists, which can be detected and remedied before it affects the machine at normal working speed of 50 words per minute.

Provided a properly organized system of periodical cleaning and testing is introduced, it is possible to maintain a service practically free from interruption due to apparatus troubles.

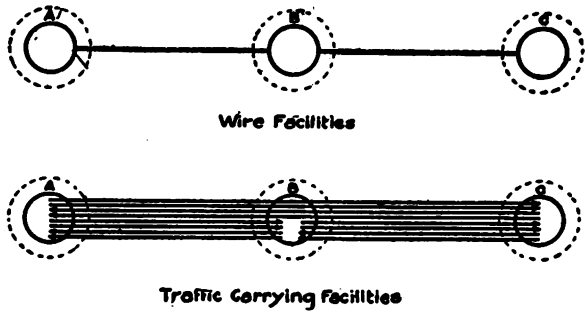

Fig. 38.

The most satisfactory method of maintaining such apparatus in correct adjustment is to specify spring tensions, distance of movement of relay armatures, airgaps etc. and to use suitable gauges for indicating whether the adjustments of the various units are within the specified limits.

Line Economies.

In the synchronous type of printing telegraph systems no spacing between signal combinations is required and consequently the code is considerably shortened as compared with the Morse where the spacing between letters is equal to three dot lengths. From studies which have been made it has been found that the average signal combination in the American Morse code is equal to eight dots, and that in the continental Morse code nine dots. In the synchronous systems the signal combinations are all five-dot lengths. As the dot is the unit of length these codes are generally referred to as eight, nine and five-unit codes. The advantage of a shorter code can perhaps best be illustrated by example. Assuming that over a particular telegraph circuit a maximum transmission speed of 45 cycles per second can be obtained. This speed of transmission will provide a carrying capacity of 100 words per minute for a nine-unit code, 112.5 words per minute for an eight-unit code and 180 words per minute for a five-unit code. Should the traffic load be such that 100 words per minute will be sufficient to carry it then the transmission speed of the five-unit code system may be reduced to 25 cycles per second. This reduction in speed will permit of operation under adverse weather conditions which

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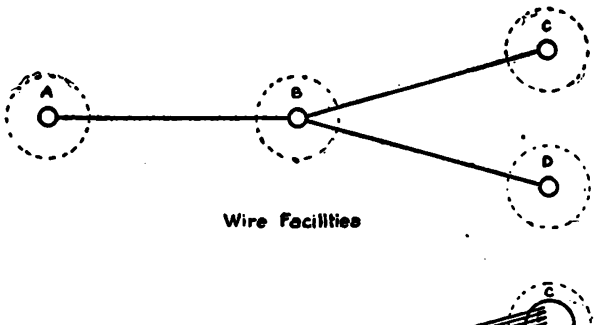
tend to disturb the duplex balance, and which would necessitate a reduced speed of working on systems using an eight or nine-unit code. The author has no data as regards actual transmission speeds over aerial lines of different lengths, but in Fig. 37 are shown the results of speed tests of underground cable circuits, which were made in England several years ago.



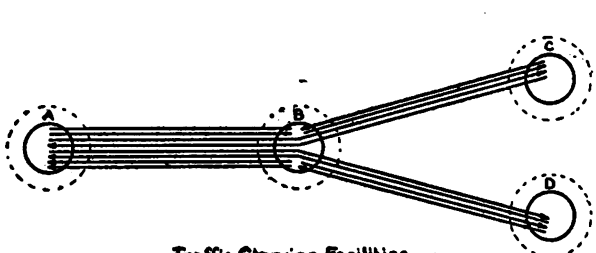


FIG. 39.

It will be seen that over a metallic return circuit of 270 miles in length having copper conductors each weighing 150 lb. per mile, a transmission speed of about 80 cycles per second is secured. This would provide a carrying capacity of 177 words per minute with a system using a nine-unit code. With a system using a five-unit code an equivalent carrying capacity in words per minute can be secured by a transmission speed of 44 cycles per second, and with the same gauge of conductors this speed can be obtained over a circuit of approximately 364 miles in length, or if 100-lb. conductors be used, over a circuit of 318 miles in length.

From the speed test figures it has been calculated that a transmission speed of 44 cycles per second could be secured over a 270-mile metallic circuit having conductors of about 75 or 80 lb. weight per mile. Assuming the wire to cost 20 cents per lb., there would be a capital saving in copper of $7560 on a 270-mile circuit, by using a five-unit code instead of a nine-unit code.

Flexibility. An outstanding feature of the multiplex system is the flexibility which it provides in linking up a number of offices with a minimum of line plant. Fig. 38 shows two quadruple duplex circuits radiating from a repeater at station *B*, and providing the following communications:

2 Channels	*A* to *B*	2 Channels	*B* to *C*
2 "	*A* to *C*	2 "	*C* to *B*
2 "	*C* to *A*	2 "	*B* to *A*

Another arrangement is shown in Fig. 39 which represents a quadruple duplex circuit between *A* and *B* linked up with two double duplex circuits between *B* and *C* and *D*.

This arrangement will provide direct communication between all offices as indicated:

2 Channels	A to B	2 Channels	B to A	1 Channel	B to C
1 "	A to C	1 "	C to A	1 "	C to B
1 "	A to D	1 "	D to A	1 "	B to D
				1 "	D to B

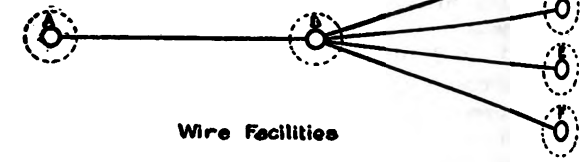
A third arrangement is that shown in Fig. 40 in which the four arms of a quadruple are shown extended to four duplex printer circuits radiating from one terminal station.

By this means direct communication can be provided between station *A* and four small stations, *C*, *D*, *E* and *F*, neither of which perhaps may have sufficient traffic to warrant a direct wire to Station *A*.

The duplex printer referred to is a two-channel system using practically the same apparatus as the multiplex, and a small distributor in which the brushes rotate once per letter combination transmitted. No synchronising arrangements are required, and as the brushes are momentarily stopped when they reach the normal or rest position the system has been appropriately termed "The start-stop system."

It will be obvious that by the combination of quadruple or double-duplex multiplex and "start-stop" installations it should be possible to effect considerable economies.

In addition to the financial savings such circuit combinations help to accelerate the service by reducing the number of times a message is handled, and this in turn tends towards a higher standard of accuracy.



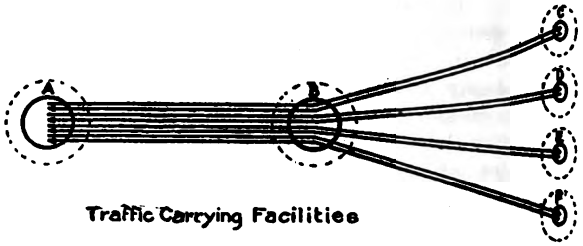


FIG. 40.

We cannot anticipate the transmission of all telegrams by connecting the originating office with the office of destination as is done in telephone practise but the multiplex in conjunction with the "start stop" will materially help towards developments along such lines.

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SOME PRESENT DAY RESEARCH PROBLEMS IN ELECTRICAL ENGINEERING

An Address Delivered by Prof. Vladimir Karapetoff of Cornell University Before the Erie, Pa., Section of the A. I. E. E., on May 17, and the Cleveland Engineering Society on May 18, 1920.

The most natural division of unsolved problems would be according to the types of apparatus; for example, into problems in the design and operation of large turbo-alternators, improvements in lamps, circuit-breakers for larger currents and higher voltages, etc. Such problems may be multiplied *ad infinitum*, and I should not venture to express my personal opinion upon their relative importance. For the last three years the *Electrical World* has had a research page on which anyone interested in the subject will find hundreds of opinions expressed by competent men as to the specific needs for theoretical or experimental research in practically every branch of the electrical industry. I wish to offer another and somewhat unusual classification for the pending research problems which may be more helpful to those interested only in the broader aspects of research.

I. Caliber of Investigator.

One division of research problems that seems to me to be quite essential is based upon the caliber and mental equipment of the investigator himself. There are problems of great practical importance which can and will be solved by the expenditure of a sufficient amount of money and time. Thus, during the war, the shortage of certain materials led to a large number of tests on substitutes, and in some cases satisfactory materials were found by men of average ability and education. A large number of such tests, sometimes dignified by the name of research, are being carried on all the time. For example, there are certain varieties of mica on the market, or lubricating oils offered by the principal concerns, and comparatively simple tests permit us to determine the kind best suited for a given purpose, without employing men of unusually high caliber.

At the other end of the scale we have researches which require men of exceptional intellectual power and of wide erudition—reseaches which have baffled the most persistent efforts of many years, and problems which remain unanswered in spite of the most alluring financial inducements. A reliable high-tension insulator and a simple variable speed alternating current motor may be mentioned as two such examples. In between these extremes there are innumerable gradations of mental caliber required for the solution of different kinds of research problems, and a clear realization of this fact is of utmost importance in the cultural development of the country. The tendency is to lay too much stress on material resources, equipment, and other external factors. A few men of superior caliber and thoroughly trained will accomplish results on which thousands of less gifted and not so thoroughly trained investigators may work for many years without much progress.

The necessity for better care of persons of exceptional scientific intellect is so urgent that it is legitimate to ask ourselves what our government, leaders of industry, educational institutions, or any other agencies are doing in this direction. The answer is, next to nothing. Moreover, in this imperfect world of ours it is no one's particular business to attend to the proper development of geniuses.

I do not have in mind a somewhat Utopian scheme of breeding a race of intellectual giants by careful mating. I have in mind a perfectly feasible scheme of detecting exceptional children by suitable mental tests and then guiding them year after year to the full development of their mental powers. This is a proper function of the state and some day will become a reality.

II. Pure and Applied Research.

Another classification of research problems is in accordance with their proximity to or remoteness from direct industrial applications. A certain physical phenomenon, a mathematical formula, a peculiar alloy, etc., may up to a certain time possess no practical importance and be merely a subject of personal interest to a few investigators. Then one day someone discovers that that particular alloy or formula offers great practical possibilities and it becomes the subject of extensive industrial researches.

While such a state of affairs may seem perfectly natural and unavoidable, it has certain serious drawbacks for the best development of the art. The electrical industry owes many of its triumphs to so-called pure physical research, but until recently this industry offered mighty little encouragement to such research or to its exponents. Had the leaders of the electrical industry realized earlier the tremendous possibilities of physical research in improving commercial apparatus, then instead of sneering at "doctors" they would have used their talent long ago, and we would have been much further advanced in the applications of electricity than we are now.

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But, it may be retorted, the scope of physics is infinite, and how can an industrial concern keep on sinking hundreds of thousands of dollars year after year on the mere possibility that some of the results of physical research may at some time prove to be of use to it? The real situation is this: Physical, chemical, or mathematical research involves first of all a method of approach, a method of attack of a certain group of related problems, based on a thorough familiarity with the resources of that particular science. Promotion of research, therefore, consists primarily in the encouragement of the study and further development of such methods and not in the acquisition of a large number of unrelated facts. A scientist trained, say, in alternating currents, will be prepared to approach a new problem in this field with much better chance of success than one who has had merely general practical experience and beats about the bush in an effort to discover a short cut by luck.

Thus the promotion of pure research is another national problem, and the first aim must be the training in the methods of analysis, general laboratory methods, the ability to find what is already known, the use of mathematics, the use of methods borrowed from other branches of science, general accuracy of measurements, of computations, of statements, and last, though not least, that loving attitude towards nature and the intuition that comes only from a first-hand contact and observation of actual physical phenomena without any preconceived theory or utilitarian thought.

In the early development of our industry we sneered at all research, then we called plain testing research, later we grudgingly tolerated industrial research; that is, an investigation of a particular piece of apparatus in its complexity. Finally, it began to dawn upon some of us that an investigation of the very physical elements which enter into that particular piece of apparatus may lead to interesting discoveries. In this way it gradually became clear that a thorough investigation of the physical laws governing this or that branch of industry may be the quickest and the surest way toward remedying the difficulties in the operation and construction of certain pieces of apparatus. I should not be surprised if in a few years we should make a fad of pure research in industrial establishments and overdo it as we overdid safety and efficiency and patriotism and many other good things.

III. Experimental and Theoretical Research.

The next division of research problems is into experimental, mathematical, inventive, critical, indicative of new fields, etc. A clear understanding of this division on the part of investigators themselves and of their business managers will help scientific progress materially in that it will allow each one to apply his effort, imagination, and inspiration where it will bear the best fruit, and it will enable two or more investigators to combine their efforts without jealousy or duplication.

Almost any big research problem involves some theoretical study as well as experimental skill, inventive ability, and patient search for the work of other investigators and its critical analysis. Only a very few investigators possess all these accomplishments to the same degree, and it is in the hands of a harmoniously organized group of scientific workers of different talents that research leads to gratifying results.

A chain is as strong only as its weakest link. Many a research worker struggled in vain with a problem for which he was eminently fitted, just because he failed to recognize this one weak link in himself or was too proud to ask for help on some particular point of difficulty.

The Anglo-Saxon race is individualistically inclined perhaps to a greater degree than the other civilized races. The Americans among the Anglo-Saxons are especially prone to exhibit the Western pioneer spirit in research with all its virtues and shortcomings, of which the utter disregard of the work of preceding investigators is perhaps the most characteristic one.

I do not mean to imply for an instant that an original thinker should be hampered in the flight of his fancy by laboratory assistants or by skilled mediocrities, in the name of a misapplied principle of co-operation. I mean two other things. First, to clear a big idea in his mind, he ought to know how to let go of it and allow his assistants to play with it for a while and see how it shapes itself in detail. Secondly, if in the preliminary molding of his ideas he should be handicapped by his lack of mathematical ability or of foreign languages (two handicaps common in this country), let him not try to solve the problem in an imperfect manner alone without first having exhausted the possibilities of associating with other gifted and congenial minds who may furnish the missing needs of the problem.

An outsider, and often a manager, thinks that research men specialize by subject, so that one knows all about direct-current machines, another all about transformers, etc. While to some extent this is true, yet there is a much more thoroughgoing and desirable specialization according to the nature of the man's talent. One is especially gifted in arranging ingenious methods for accurately measuring difficult quantities, whether it be in a-c or d-c machinery, another can skillfully present a phenomenon or a relationship in a mathematical form, a third is particularly adept in finding out quickly and accurately all the preceding contributions on the subject and in assigning the proper relative value or trustworthiness to each.

The possibilities of co-operation in research on the part of persons of different temperament and ability go far beyond the confines of one industrial organization or even one country. International co-operation in research is just as important in view of the favorable and unfavorable racial idiosyncracies. Any one who follows European scientific magazines cannot fail to notice these racial distinctions in the treatment of identical subjects.

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A student of the history of science can easily recall cases in which a scientific idea is born in one country and then is taken up by someone in another country, and finally brought to a fruitful development in a third country.

Perhaps the best known example in our line is that of Hertz, a German, who acted as an intermediary between Maxwell, an Englishman, and Marconi, an Italian. A biologist could easily get examples of living organisms which have to live under different conditions at the various stages of their development. Thus the rust of wheat must live on barberry before it can live on wheat. We in this country with its polyglot population have had an exceptional opportunity to observe and to benefit by this co-operation right in our midst, even though in our Anglo-Saxon arrogance we are apt to look down upon our brothers from across the seas. There is hardly an organized institution for research in this country that cannot point to benefits derived from associates of foreign birth, training and point of view.

In conclusion, I wish to point out that while first-class, original investigators are born and not made, yet there is a great problem before our leaders in politics, industry, and education, to facilitate the work of such men by granting favorable conditions for their creative activity. We ought to do this for our own sake and for that of the coming generations. It is in the hope of contributing to the clear understanding of the conditions that promote the welfare of research workers that the preceding remarks are made.

(During the address Professor Karapetoff gave examples of electrical research done or suggested by various prominent investigators.)

IN AUSTRALIA, the sixteenth annual meeting of the Associated Chambers of Commerce of the commonwealth of Australia was held in Sydney on March 15th, when the following resolutions were submitted:—"That the commonwealth government remove the restrictions on the development and application of wireless communication in Australia, and permit private individuals or companies to operate stations for commercial purposes and for their own private use, subject to any reasonable regulations which might be necessary to protect all users against unnecessary interference."

"That the commonwealth government be asked to do the utmost to have the present Pacific cable duplicated at the earliest possible moment, and also that it arrange for wireless communication with both the United States and Canada."

THE OLD WIRE CHIEF SAYS: "I have often wondered why more telegraphers do not take up the study of electricity with a view to getting into the retail electrical business. They have unusual opportunities for gaining first-hand, reliable information. There are too many blacksmiths and plumbers running electric shops."

Telegraphs and Telephones in Finland.

There are 8,720 miles of telegraph and 2,891 miles of telephone lines in Finland. The telegraph system and a part of the telephone system is state property, though the greater part of the telephone lines are privately owned.

Supplying international needs there is one line between Tornea and Haparanda, several lines between Viborg and Petrograd (now broken), one line between Ivalo and Petsamo Alexandrovsk, and the following cables: Two telephone cables and one telegraph cable between Helsingfors and Reval (Esthonia), three telegraph cables between Nystad and Grislehamn (Sweden), and one telegraph cable between Nystad, Oland, and Grislehamn (Sweden). These cables were laid and are owned by Det Store Nordiske Telegrafselskab, a Danish company that has the concessions for international communication by these routes.

The principal lines of telegraphic communication are Helsingfors-Nystad-Stockholm, Helsingfors-Reval, Helsingfors-Petrograd (now broken), Helsinfors-Uleaborg-Tornea-Haparanda, Helsingfors-Uleaborg-Rovaniemi-Alexandrovsk (now broken).

The one radio station at Helsingfors is administered by the military authorities. It has a radius of 600 miles. Arrangements have recently been made to maintain communication with commercial vessels at sea.

There are 72 offices in Finland receiving messages for transmission abroad and 303 railway telegraph stations from which international messages may be dispatched.

A new telephone line is in process of construction between Tornea (Finland and Haparanda (Sweden).

Telegraphic communication with Finland has increased 700 per cent since 1914. Up to the end of 1918, Finland used only one of the four cables over Nystad-Grislehamn. Arrangements have now been made with Det Store Nordiske Telegraphzelskab for the use of three of these lines for Finnish messages, thus leaving one line entirely free for messages going over Finland. A material increase in the communication over Finland will render the present system inadequate.

American merchants are lodging many complaints on account of delay in the transmission of messages from Finland to the United States. The time required in making a telegraphic inquiry in the United States is from eight to twelve days. Messages originating in the United States require approximately one to two days in transmission to Finland. Finnish authorities state that the delay in transmission of commercial messages to the United States is not occasioned in the Scandinavian lines but in the Atlantic cables.

IN MEXICO, the government is planning the erection of a new chain of radio stations. High power apparatus is to be installed at a number of important stations.

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SYSTEMS OF HIGH-SPEED TELEGRAPHY

AT a conference of the French Society of Electricians held on June 4, 1919, a contribution on the above subject was given by M. Montoriol, Inspecteur des Postes et Télégraphes. The paper is given in full in the "Annales des Postes, Télégraphes at Téléphones" for September, 1919, occuping 58 pages. In it he deals with Wheatstone, Creed, Murray automatic, Siemens automatic, Buckingham-Barclay and Pollak-Virag, representing the automatic systems, while the multiplex systems include the Baudot, Delany, Rowland, Baudot-Dubreuil, Murray duplex multiplex, Western Electric duplex multiplex, Western Union duplex multiplex and the Mercardier systems.

The study of this highly important and complex subject has been well carried out, as one would expect from this well-known authority on French telegraph matters, and his conclusions are very interesting, as they represent the French view of the advantages and disadvantages of the various systems so far as they apply to the French telegraph service, and to a less extent, perhaps, to other services.

The author states that he has endeavored to deal with the matter from a purely technical standpoint, quite apart from any commercial, national or other consideration that might lead to a false conclusion. In this respect it can be said that he has succeeded very well indeed.

There are one or two minor points that need correction; viz.:

(1) The speed of the Creed receiving perforator is given as 120 to 130 words per minute, and although this is the usual working speed when it is used in conjunction with Creed printers, it is very far from being the maximum, which is in the neighborhood of 220 words per minute.

(2) The Creed printer is given a speed of 125 *letters* per minute. This is no doubt a printer's error, as the machine works well at 125 *words* per minute and has frequently done 140 words per minute.

(3) The Siemens automatic is given a speed of 500 to 600 revolutions per minute or 100 words whereas the set purchased in 1913 for the British service regularly works at 1000 revolutions or 166 words per minute.

After considering the systems the author gives his provisional conclusions as follows:

Preference should be given to—

(1) Systems having multiple transmission.
(2) Systems employing the Baudot code.

He then proceeds to compare these, viz. the Baudot, Murray duplex multiplex, Western Electric duplex multiplex and Western Union duplex multiplex. He says: "The Murray multiplex is a Baudot arranged to work exclusively at duplex," and then refers to the striking resemblance of the Western Union and Western Electric to the Murray, thus giving all three similar advantages and disadvantages. He states that the two latter also are practically Baudots. On this account he groups all three and refers to them as the Anglo-American Baudots to distinguish them from the French Baudot.

It is considered that he should have included with the Anglo-American Baudot the British arrangement of duplex Baudot, because it was due to the remarkably successful results that were obtained by this arrangement, that the Americans were led to try it and subsequently to develop it into their present system.

As a matter of fact the first American experiments were made with two Baudot distributors purchased in England from the representative of the French manufacturer, M. Carpentier. Further, the completed sets have followed exactly the earlier British arrangement; viz.: permanent duplex, no matter whether the apparatus is used on aerial or underground lines.

M. Montoriol considers this to be a disadvantage and gives his reasons, but the fact remains that the British and American services have many sets working on aërial lines and have not found the disadvantages sufficient to warrant a departure from the arrangement, although on long and difficult lines a switch has been provided for utilizing two lines on a duplex set, one line for receiving and the other for sending, without otherwise disturbing the set or the positions and working of the operators. So satisfactory has this arrangement proved that it is unlikely that the purely simplex French Baudot installations with transmission in both directions on one wire will be utilized other than to France. In fact it would be an all-round advantage if all the sets to France were changed to double duplex in those cases where there is not sufficient margin for triple duplex.

In regard to duplexing systems, the author states that it is not the apparatus but the line that is duplexed. This is, of course, as far as it goes, technically correct, but it does not go far enough, for in every case the duplexing of a system means considerable modifications and addition of apparatus to the terminal sets, while the line itself remains absolutely unaltered. It is the arrangement of connections and disposition of the apparatus, switches, etc., that determine whether the duplex installation will be successful or not under the usual working conditions. Further, the use of the Baudot system (*i. e.* the French simplex Baudot) was limited and the spread of its use was quite a slow matter; but following the publication of the British results of duplexing the Baudot its extension became very rapid. The first British Baudot duplex circuit (named by the British Committee on High-Speed Telegraphy the "Booth-Baudot duplex") was established in June, 1910, and since that date; *i. e.*, in less than ten

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years, the number of Baudot duplex sets introduced, including the Anglo-American type, is some three or four times greater than the number of Baudot simplex sets that have been installed during a period five times as long. This fact speaks for itself, and plainly indicates that there is a considerable difference between the purely French Baudot and the Anglo-American Baudot.

The British Post Office arrangement for duplexing the Baudot has been adopted, among many other services, by the French telegraph service, and there is now very little difficulty in obtaining good double and triple duplex working on several lines between London and Paris.

In a previous issue of the 'Annales,' M. Montoriol explained that it was because of the need for standardization and unification of material that the French Administration ceased to use the one double duplex that was in use in 1900, replacing it by quadruple simplex, which met the traffic requirements equally well. It was not until 1914 that the duplex was re-started in France, and it has now proved so very useful that it is hardly likely to be put aside again. We may even yet see the Baudot duplex as the standard for the French service.

We will now give fully the author's final conclusions:

"The Baudot equipped with automatic transmission, and as an accessory the phonic wheel drive, will keep the premier position that it has held up to the present because of its irreproachable working and the robustness and simplicity of its various parts, which allow it to be placed in the care of officers who are the least specialized; also because of its incomparable flexibility to meet all requirements and all circumstances. It will be worked duplex if the needs arises on all the lines where its rivals are able to do so. It will keep the first place as long as no other system based on a new principle challenges it; this principle may perhaps be that of the Rowland, of which the first utilization seems to have been incomplete; or it may be the Pollak-Virag, of which the extraordinary rapidity is unhappily counter-balanced by most serious defects. It would without any doubt be rash to prophesy in this respect, for a third system may arise at any moment to reverse completely our actual conception of rapid telegraphy. When that time arrives the Baudot will have to give place to a newcomer, as it has itself displaced its predecessors, and our national pride will not be injured thereby, since the Baudot will have held a glorious place in the annals of telegraphy. The importance of this position is confirmed by the efforts of inventors, whose merits it would be unjust to decry, but who in the impossibility of discovering this new and better principle find no other use for their ingenuity than in modifying the Baudot system, sometimes with advantage, sometimes indifferently, and sometimes inopportunely. That is certainly the purest homage that the clever French inventor could desire.

"It will undoubtedly be recognized that the author of this study, in order to keep quite impartial, has banished systematically all sentimental considerations; the words 'National Industry,' which have their value, have not once been mentioned, and it is solely from the technical and experimental point of view that the matter has been discussed.

"The conclusion therefore acquires only greater weight, and in the eventuality of its adoption by the administration it will only result in some purely commercial inconvenience to our English and American friends, who are technically too good to be surprised thereby."—*Post Office Electrical Engineers' Journal, London.*

Engines of Efficiency.

By P. J. Tierney.

The busy Captain of Industry conceives an idea which in its working will vitalize the plans of sales forces! He presses a button which closes an electric circuit causing an insistent bell to summon a stenographer, and within a minute or two telegrams are dictated addressed to the men in the field who are alert and on tip-toe awaiting a tip from headquarters!

The second cycle of events is worth noting. In the stenographer's note book the telegrams were inscribed at the end of a dozen pages of letters to be put in the evening mails. She works on the letters first, and perhaps the lunch hour arrives before she reaches the telegrams. After the mid-day meal has become history the telegrams are typewritten and the messenger call box is operated to summon a boy. It may be that when the boy arrives at the offices of the Captain of Industry the information clerk knows nothing about the telegrams to be dispatched; or perhaps the boy is sent to one or two departments where the clerk thinks messages may be waiting. Time flies. The boy does not find the messages, and returns to the telegraph office empty handed.

The idea that was so important that it was to be put on the wires and sent at lightning speed to waiting agents has not yet travelled more than a few yards from its source—it is not yet at work.

During this time an engine of efficiency stood invitingly upon the desk of the Captain of Industry, but he did not use it—the telephone.

He could have dictated his telegrams to a trained clerk in the telegraph office at the same time his own stenographer was copying them for record, and the wires would have been serving his interests instantly; or the stenographer could have telephoned the messages after copying them in her note book.

It is of more importance to the sender of a telegram to insure prompt handling of the message than to anyone else, and what steps he takes to speed a telegram on its way is purely to his own advantage.

The telegraph and the telephone are engines of efficiency, and they work well in multiple or in series.

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RADIO TELEGRAPHY.

Radio Corporation of America Notes.

PRESIDENT E. J. NALLY recently inspected the stations at Boston, Chatham, and Marion, Mass., and New Brunswick, Belmar, Lakewood, and Tuckerton, N. J.

THE FIVE TELEGRAPH OFFICIALS from Denmark, now visiting in this country, on May 30 inspected the stations at Belmar and Lakewood, N. J., as guests of the Radio Corporation. Luncheon was served at Belmar and dinner at Lakewood.

W. R. CROSS, traffic manager, and J. D. White, engineer of the British Marconi Company, have returned to London after a stay of several weeks in the United States.

THIS COMPANY has opened a new coastal station at No. 47 West Street, New York, the call letters being WNY. The manager in charge is John W. Swanson.

G. J. ESHELMAN has been appointed engineer in charge at New Brunswick, N. J., vice S. R. Ford, resigned.

T. C. MANNING is chief inspector at New York, with office at No. 326 Broadway.

A. B. TYRELL has been appointed junior receiving engineer at the Lakewood, N. J., station. During the war Mr. Tyrell was transatlantic operator in the Naval service, Otter Cliffs, Me., station.

J. PETERSON and W. PITZNER have been appointed members of the operating staff at the New Brunswick, N. J., station.

C. B. ELLSWORTH, recently in Radio Corporatoin service, has been appointed radio supervisor in the service of the Shipping Board.

L. C. NOBLE has been appointed inspector at Norfolk, Va.

J. W. HARTE, formerly chief operator at the Philadelphia, Pa., office, is now in charge of the Philadelphia office of the Wanamaker radio service, operating with New York.

L. C. DENT is chief operator and constructor of the Lake Michigan District, with office at Chicago.

F. G. SIEGEL, formerly chief operator of the Cleveland, Ohio, office, is now inspector in the Great Lakes Division.

SHAREHOLDERS of the American Marconi Wireless Telegraph Company of America, at a special meeting held on April 6, voted to dissolve the company. This action finally concludes a plan whereby the assets of the company, with certain exceptions, are taken over by the Radio Corporation of America.

DURING THE STAY in New York of the Danish Government Commission on Radio Affairs, President E. J. Nally, of the Radio Corporation of America, entertained the members at a luncheon at the Lawyers' Club. Covers were laid for twenty guests.

F. C. WALKER has been appointed manager of the Cleveland, Ohio, office of the Inter-City Radio Telegraph Company. Edward I. Deighan, formerly in the Naval radio service, Great Lakes Division, has been appointed construction engineer for the same company.

RADIO OPERATORS working on transatlantic vessels report that the operators at Cape Race (VCE) who send from 9 p. m., until 1 a. m., are the most expert, and at the same time most easily read, operators working at any radio station on either side of the Atlantic.

APPLICATIONS will be received by the United States Civil-Service Commission, up to July 6, 1920, for the position of radio engineer (aeronautics) at a salary of from $3,600 to $5.000 per year, and for the position of assistant radio engineer (aeronautics) at a salary of from $2,500 to $3,600 per year.

THE TELEFUNKEN radio station in the Province of Cartagena, Colombia, which was sealed by the Colombian government during the war, has been released and turned over to a representative of the German company. It is reported that the station is to be placed in service shortly.

Charles Hogger Returns to America.

Radio operators of United Wireless Company days will remember Charles Hogger, one of the expert operators engaged in the earliest commercial operation of wireless in this country. When the world war began Mr. Hogger was in Russia and was appointed electrical expert in charge of radio installation work on Russian war vessels. He remained in the service during the four years of the war and participated in several actions between Russian and German war vessels in the Baltic.

Mr. Hogger, during his stay in Russia, had close relations with the high officers of the fleet and was given many important missions to carry through. When the fighting shifted to the Finnish front, upon the collapse of the Russian Empire, Mr. Hogger continued to serve the Russian government under the new leaders, and his diary contains entries of many unpublished developments and experiences which some day should become recorded history.

He brought home many tokens which attest his close association with the military and naval authorities. He was made a Chevalier of the Order of St Stanislaus, and later Chevalier of St. Anna., besides which he was presented personally by the Czar, Nicholas Second, with a massive solid gold watch and chain bearing the Imperial arms and monogram. He was also decorated with a gold medal in connection with his work in rescuing passengers from the steamship *Volturno* in 1913, and a silver medal for saving life at sea on other occasions. These valuable and prized decorations, together with the written citations which accompanied them are now in Mr. Hogger's possession.

His wife is now en route from Europe to New York and when she arrives Mr. Hogger intends taking service here with one of the radio companies.

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FIVE YEARS in telephone service and still being used.

That's the record of a set of Edison Primary Batteries installed upon a prominent Eastern railroad (name upon request).

And the man in charge of those batteries says that the transmission is always clear and remains uniform at all times.

We'd like to tell you more about this particular use of Edison Primary Batteries. Fill out, clip that coupon and send to us right this moment.

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THOMAS A. EDISON, INCORPORATED
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Kindly send me information concerning the use of Edison Primary Batteries in telephone service.

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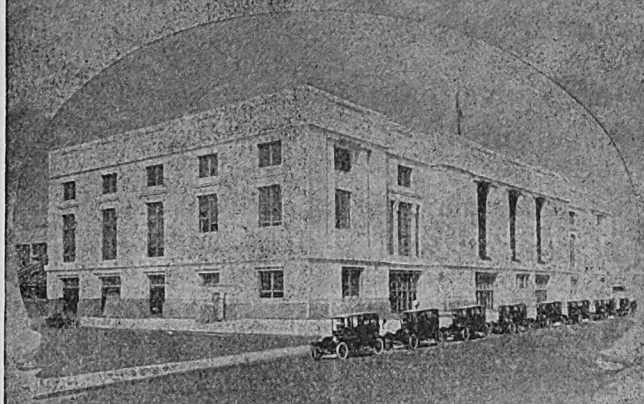

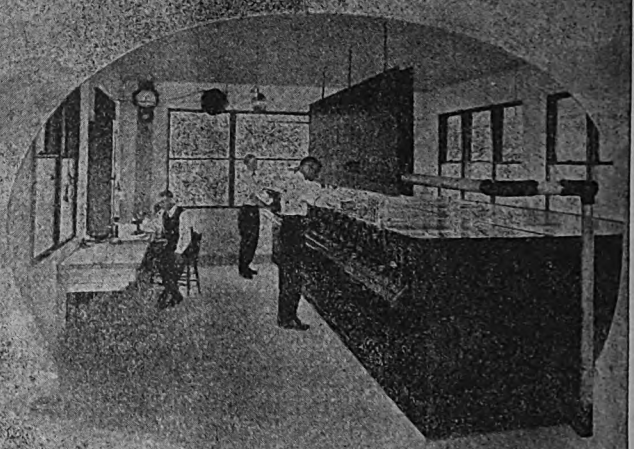

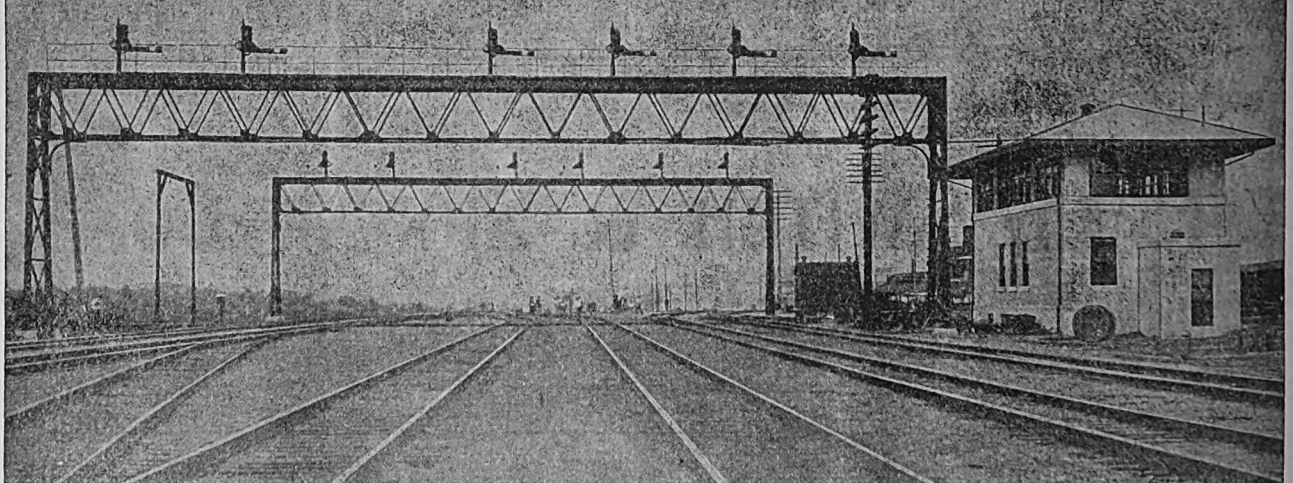

UNION TERMINAL
DALLAS, TEXAS

DAYS KERITE

KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO

DAYS KERITE

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THE CABLE.

GEORGE GRAY WARD, vice-president and general manager at the Commercial Cable Company, New York, has sailed for Europe where he will remain several weeks on business of the company.

D. H. CAMERON, assistant superintendent Western Union Cable station, North Sydney, N. S., is stationed temporarily at the cable office at St. Pierre, Miquelon.

SID PEARCE, purser of the cableship *Restorer*, accompanied by members of his family, spent a short vacation with relatives at Nanaimo, B. C., in May.

TWO ADDITIONAL SUBMARINE CABLES were laid across the English channel, between Dover and Ostend, during the latter part of April.

THE GOVERNMENT OF GREECE advises that until further notice cablegrams for points in Greece are restricted to the English, French, Italian and German languages. Codes permitted are A. B. C. fifth edition, Bentley's, Complete Phrase, and Scott's.

A REPORT from a British source states that recently a contract was concluded and order placed for a quantity of submarine cable to be laid as a duplicate link between Bamfield, B. C., Canada, and Fanning Island, in the Pacific, and that the laying of an additional Atlantic cable between Great Britain and a Canadian port is being considered.

J. C. BAILEY, who has been at the Miami, Fla., cable station, Western Union Company, during the past four months, has returned to Bay Roberts, N. F., where he is acting superintendent, relieving W. T. Jones, who is on vacation.

J. F. RICHARDS, heretofore assistant superindent of the Western Union cable station at Hearts Content, N. F., is temporarily located in the general traffic manager's office, New York, preparing details in connection with the work at Miami, Fla., where he goes as superintendent in the near future.

GEORGE MACKAY, formerly of the Vigo, Spain, station of the Eastern Telegraph Company, and during the past three years at the Bay Roberts, N. F., cable station of the Western Union System, is attached to the general traffic manager's office in New York.

FRANK KAY, of the North Sydney, N. S., cable station, Western Union Cable System, has joined the staff of the general traffic manager at No. 38 Broad Street, New York.

Cable Staff Changes.

EASTERN EXTENSION TELEGRAPH COMPANY: A. W. Blackford, J. F. Bristed, R. D. M. Colyer, E. W. H. Graham, C. P. Greenfield, G. T. Morrell, G. K. Shepherd and D. W. Townley, Cocos to Singapore; F. J. Atkins, E. E. Franklin, C. Hall, J. K. Inge, F. Matson, F. C. Pepper, E. J. Smart, C. H. Wookey, from Singapore to Cocos. H. F. Gray, Penang to Banjoewangie; W. A.Rose, Sharp Peak to Singapore; H. Warren, Penang to Sharp Peak; B. G. Grigor, Banjoewangie to Singapore, and J. G. Lawrie from Singapore to Adelaide.

WEST COAST OF AMERICA TELEGRAPH COMPANY: S. N. Edrupt, Buenos Aires to Valparaiso; C. R. Addison, England to Buenos Aires; C. C. Robinson, England to Rio de Janeiro; R. F. Hunt and J. A. Savage, Montevideo to Rio de Janeiro; H. J. I. Calviou and J. S. E Clancy, Madeira to Montevideo, and N. V. Nicolle, Madeira to St Vincent.

PACIFIC CABLE BOARD: F. Richardson and A. G. Miller, Auckland to Suva.

IN BELGIUM, the postal and telegraph services are gradually being restored. According to the *Echo de la Bourse* quoted by the *Economic Review*, there were in 1914, 44,564 km. of telegraph wires in use; in 1919, only 24,397 km. A tremendous amount of damage had been done by the Germans to the telegraph system. The present scarcity of copper wire adds to the difficulty of restoring the service to normal conditions. In 1914, 2,694 offices were in operation; in 1919 there were 2,295. The number of telegrams sent in 1914 was 4,407,906, as against 4,066,882 in 1913. The number of telephone subscribers before the war amounted to 54,691, as against 1,844 in January, 1919, and 30,383 in December, 1919. Almost all the pre-war post offices have been re-established.

IN ECUADOR, the National Government has appropriated a sum of money for the erection of a radio telegraph station at Guayaquil. On March 8, 1920, the President of Ecuador issued a decree prohibiting the installation of private radio telegraph or telephone stations, movable radio telephones, or the possession of apparatus to intercept radio signals.

IN MATANZAS, Cuba, four new telegraph offices have been recently established.

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Students' Course in Technical Telegraphy

LESSON No. 7.

TELEGRAPH RELAYS.

One of the first things to puzzle an inquisitive operator, after he learns to telegraph, is why it is necessary to have both a relay and a sounder working when a message is being received. At small offices throughout the country each wire cut into the office may be equipped with a relay and a sounder, both of which operate simultaneously when messages are being transmitted over the wire. The operator who learns to telegraph in a large office generally finds himself during the first few months of his service assigned to circuits equipped with both relays and sounders. After he becomes more expert as an operator he may be assigned to operate a cricuit which, so far as he can see, is equipped with a key and two sounders, but no relay.

The transition from an ordinary relay and sounder circuit to a circuit with two sounders and no relay is an interesting period in an operator's career. If he is hopefully inquisitive it may be observed that he is asking questions which in due time will lead to knowledge. If he persists in questioning those who know, as occasion presents, in the course of time it will be found that he has become an assistant chief operator, or a wire chief; for, knowledge comes only to those who seek it. Every chief operator, and practically every official in the telegraph business to-day was "an inquisitive youngster" when he was a cub operator.

Now, as to relays. In the previous lesson (No. 6) it was stated that a sounder wound with wire having a resistance of four ohms requires a current of about one-half ampere flowing through it in order to work satisfactorily. It may be stated, further, that an ordinary electrical bell of the pushbutton variety requires a current of about one ampere to operate it. Suppose it is desired to arrange for a bell signal between two towns one hundred miles apart. If the bell will not operate unless a current of one ampere flows through the wire in its electromagnet coils, then it is necessary to apply a generator of 1,200 volts to the wire, assuming that an iron wire is available between the two towns which has a total resistance of 1,200 ohms.

This may be proved by referring to the third formula given in Lesson No. 4, May 1 issue, which states that the electromotive force (E) in volts may be determined by multiplying the current (I) in amperes by the resistance (R) in ohms. In the case of the electric bell we have a resistance of 1,200 ohms (the resistance of the wire in the electro-magnet of the bell may be neglected, as it is but 3 or 4 ohms and very small compared to the 1,200 ohms of line wire) and a required current of one ampere. Therefore, multiplying 1,200 by 1, we learn that 1,200 volts will be required to supply a current of one ampere through a circuit possessing a resistance of 1,200 ohms.

Now, 1,200 volts potential is dangerous to life. At Sing Sing prison a voltage of about 1,700 is used to electrocute murderers, so it would never do to use such a high potential as 1,200 volts on wires connected to instruments which constantly are being

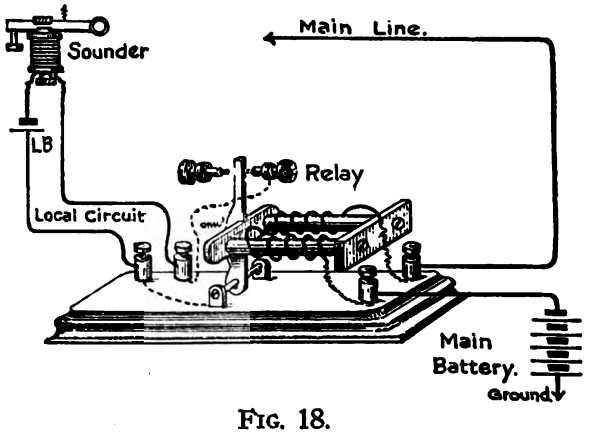

FIG. 18.

touched or handled by employees. Indeed, it is not necessary to use voltages higher than 35 or 40 if a sensitive relay is connected in the line circuit and the relay in turn connected to the bell through a local battery.

There are many wonderful types of relays which operate on very small current strengths, and some relays of a given resistance operate more satisfactorily with a stated current than do other relays of the same resistance, but for practical purposes it may be regarded that a relay wound with wire having a resistance of fifty ohms requires a current of .075 ampere (seventy-five milliamperes); a 150-ohm relay, a current of .050 ampere (fifty milliamperes); a 250-ohm relay, a current of .030 ampere (thirty milliamperes), and a 500-ohm relay a current of .020 ampere (twenty-milliamperes).

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The word "milli" signifies one-thousandth, so that thirty one-thousandths of an ampere are the same as thirty milliamperes.

Once more referring to the electric bell circuit 100 miles long. Suppose we use a 500-ohm relay in the line circuit instead of connecting the bell directly in the line. To operate the 500-ohm relay we require a current of .020 ampere—one-fiftieth of an ampere. The same formula (the third in Lesson No. 4), if applied to the problem, will show that a potential of thirty-four volts will be sufficient to supply a current of .020 of an ampere through a resistance of 1,200 ohms (the line wire) plus 500 ohms (the resistance of the relay).

Quite a difference, isn't it? Connecting the low resistance bell directly in the circuit requires a potential of 1,200 volts, while if a relay is used which will operate on a current of twenty milliamperes, a potential of thirty-four volts is sufficient.

on the base of the relay to the right are the main line wire posts, while the two posts on the left are the points to which the sounder and the local battery *LB* are connected. One end of the main line battery is attached to a ground wire. The wire marked "main line" is first connected to a sending key and then passes through the main line switchboard to the distant station.

Figs. 8, 16, and 17, presented in previous lessons, show the wiring of generators supplying current for main line operation and for the operation of local instruments—sounders, etc. Fig. 19 illustrates the binding post connections of a relay and sounder, the main line wiring shown in solid line and the local wiring in dotted line. The diagram shows the generator supplying current to operate the sounder. On the fuse-strip there are a number of blank contacts to which four other sounders might be connected, as described in connection

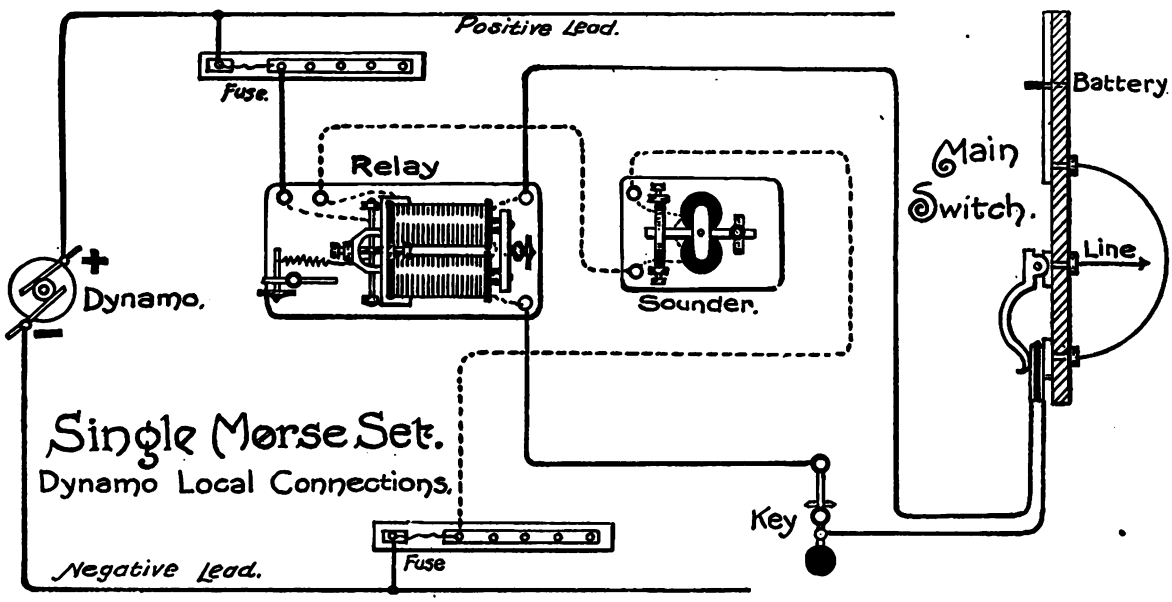

FIG. 19.

The armature of the relay may, of course, be employed to close and open a local circuit which has but a few feet of wire connecting the relay contact points, the local battery and the bell.

This example of the electric bell suggests why a relay and a sounder are necessary in working a telegraph circuit. In order to read the incoming signals in Morse characters it is necessary that there be a considerable volume of sound made by the reading instrument—the sounder. A sounder with its heavy armature requires a strong electro-magnetic strength to operate it; but instead of supplying at the distant end of a long circuit a potential great enough to supply through the entire circuit a current strong enough to operate the sounder, a sensitive relay is used to respond to small current strength in the line wire; the movements backward and forward of the relay's armature being utilized to close and open the local sounder circuit.

Fig. 18 shows a diagram of the outside and inside wiring of a telegraph relay. The binding-posts

with Fig. 8. The main line wires from the relay are shown connected through the sending key, thence to a cord and wedge inserted in a spring-jack of the main line switchboard. This is a type of switchboard still used in many Western Union offices, and is similar to the main line board used by the Postal Telegraph-Cable Company and by many railroad telegraph departments.

In may be observed that one metal side of the "wedge" is in contact with the curved shank of the spring-jack and that the hinged end of the jack is connected to a line wire, while the wire leading from the key is connected to the inside metal strip of the wedge which in turn is in contact with a metal strip connected by a short wire to a battery strip in the upper part of the board. In the diagram a plug is shown inserted to connect the main battery lead so that current will flow into the relay circuit by way of the cord and wedge. The point marked "battery" shows where one of the wires from the resistance coils illustrated in Fig. 16 terminates at the main board.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL.

H. J. PETTINGILL, chairman of the board, Southwestern Telegraph and Telephone Company, St. Louis, was a New York official visitor recently. While in the city he called upon several old-time friends.

PATRICK B. DELANY, the well known telegraph inventor, on May 30 left New York for Cape Cod, Mass., where he will spend the summer months.

N. T. COLLETTE, formerly of Seattle, Wash., was a recent visitor in New York, *en route* to Atlanta, Ga., where he will be general field manager of the Southeast territory for the California Associated Raisin Company of Fresno, Calif.

J. B. DILLON, the well known writer on telegraph subjects, now a member of the testing and regulating staff of the Denver, Colo., office of the Western Union Telegraph Company, has become a successful contributor to popular magazines which publish Western stories.

M. O'DONNELL, for many years operator at the New York end of the Pacific cable circuit, 20 Broad Street, is now a member of the telegraph staff of E. F. Hutton & Co., New York.

M. A. NOSS, assistant chief engineer of the Telepost Company, New York, has brought out an improved Morse duplex circuit which operates on main line currents of twenty milliamperes or less. The system is of especial value on circuits carried through underground or aerial cables which also contain telephone circuits.

THE OLD WIRE CHIEF SAYS: "I have learned that there is one way in which a person can determine for himself whether or not he thoroughly understands a subject. If he can write down in plain English his ideas in regard to the matter so that others can follow his reasoning, then he knows what he is talking about. If he cannot do this he should realize that his ideas still are hazy."

IN VENEZUELA, the Government of the State of Bolivar has ordered the construction of a telephone line from the city of Bolivar to La Paragua, capital of the municipality of Barceloneta. The line will be 200 kilometers long.

POSTAL TELEGRAPH-CABLE COMPANY

C. A. COMSTOCK, W. C. DAVIET AND E. P. TULLY, assistants to the general manager, New York, attended the Republican National Convention in Chicago.

J. J. WHALEN, traffic manager was in Chicago during the Republican convention.

J. A. MCNULTY, wire chief, and T. J. Kreger, traffic chief, New York main office, have returned from their vacations. C. B. Obst and W. J. Kavanagh, have departed on their annual furloughs.

MANAGERS APPOINTED: C. M. Williams, Little Rock, Ark.; G. A. Clemens, Cedar Rapids, Ia.; H. H. Julian, Fort Worth, Tex.; C. H. Waggener, Orange, Texas; John Favor, Gloucester, Mass.; Ray D. Palmer, Galva, Ills.; B. Cla Childers, Fulton, Ala.; T. H. Moore, Pelham, Ga.; A. J. Daniel, Cornelia, Ga.; M. H. Yerby, Ripley, Miss.; A. M. Howard, Hudson Falls, N. Y.; E. C. Hartley, Ellinwood, Kan.; G. G. McCracken, Great Bend, Kan.; J. B. Zonfrillo, Taunton, Mass.; J. C. Crowley, New Bedford, Mass.; A. H. French, Lake Charles, La.; G. R. Rose, Crowley, La.; Miss T. M. Pepper, Salem, Mass.; L. Heisman, Camden, N. J., and Miss E. G. Collins, Atlantic City, N. J.

New York City Postal Notes.

CHARLES RUFFER, for thirty years manager of the branch office in the wholesale butter and egg district, has resigned from the service to engage in business for himself.

A NEW BRANCH OFFICE with up to date equipment will be opened shortly at 15 Washington St. E. T. Flannagan will be manager in charge.

T. P. LOWERY, formerly operator at the Fulton Market office, has been appointed manager of the branch office at 520 Hudson St.

MISS KRESHEFSKY has been appointed manager of the office at 77 Bowery.

C. BANANTE, formerly assistant at the Hudson Terminal branch office, has been promoted to the managership of an uptown branch.

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Albany, N. Y., District.

F. S. ALLEN has been appointed manager at Hudson, N. Y.

N. C. HOXIE, from New York, has been appointed chief operator at Plattsburg, N. Y.

P. M. BATCHELDER, chief clerk to Superintendent C. A. Richardson, has returned from his vacation which he spent in the mountains.

MISS A. M. HOWARD has been appointed manager at Hudson Falls, N. Y.

Philadelphia, Pa., District.

THE BALTIMORE operating room is being entirely renovated and the bookkeeping department enlarged to take care of the greatly increased business.

R. W. KANZLER, traffic chief at Baltimore, has been appointed day wire chief and Mr. F. A. Hilmer has been appointed traffic chief.

C. W. Dickerson has been appointed manager at Salisbury, Md.

R. E. CUNDY has been appointed manager at Princeton, N. J.

GEORGE SHIELDS has been appointed manager at Norristown, Pa.

AGNES G. MATTHEWS has been appointed manager at West Chester, Pa.

SUPERINTENDENT C. A. BAGLEY has just completed an inspection trip of a number of offices in Maryland and Central Pennsylvania.

Postal, Pacific Division.

B. W. FIELDS, division engineer, is at Portland, Ore., in connection with office improvements under way there.

EDWARD BOYDEN, cashier, main office, San Francisco, died on May 27, of heart trouble.

V. A. HUNTER has been appointed manager at Ashland, Ore., vice Mr. Mowatt, who takes the position of late night chief operator.

JOHN MCILVANE has been appointed manager of the "Ax" branch office, Seattle, Wash. He learned the business in the Seattle main office.

J. J. LYNCH, superintendent of construction, San Francisco, covered the pole route over the Cascade Mountains recently, accompanied by district foreman Witt.

C. D. CLARKE, assistant chief operator, Seattle, Wash., has returned from a trip to Yakima, Wash., where he inspected the telephone equipment.

Gordon A. Francis, Traffic Chief, Postal Telegraph-Cable Company, Washington, D. C.

The subject of this sketch, Gordon A. Francis, although but twenty-seven years of age, has had wide and varied experience in the telegraph field. He was born at Ashburn, Virginia, and after attending primary schools there took a course in a business high school in Washington, D. C.

Entering the telegraph service of the Southern Railroad, he soon was promoted to a position in the general offices of the company at Washington. Then with the desire to gain a knowledge of methods on other systems and in other parts of the country, Mr. Francis took a position in the Pittsburg, Pa., office of the Western Union Telegraph Company, from where he went to the general telegraph office of the Pennsylvania Railroad, later working on the Northern Central Railroad and the Baltimore and Ohio Railroad.

In the year 1915 he entered the service of the Postal Telegraph-Cable Company at Washington, D. C., as operator, and during the following two years worked the Chicago and Birmingham bonus circuits. He was then placed in charge of the concentrator switchboard, where he established an enviable reputation as a traffic chief, with the result that he was later advanced to the position of traffic chief in charge of trunk circuits.

Mr. Francis, himself a first-class Morse telegrapher, is a good judge of telegraph talent and has the faculty of being able to so dispose his staff that traffic is moved smoothly and with a minimum of delay to the individual telegram.

Like many other expert telegraphers, Mr. Francis has an avocation which is both interesting and profitable. He has written a number of popular songs which have gained wide circulation.

Telegraph Men Should Join Technical Societies.

Chief operators, wire chiefs, and multiplex attendants in the service of the commercial telegraph companies, cable companies and railroads, who identify themselves with technical societies seldom fail to derive therefrom direct benefit to themselves.

During the past two years quite a number of the younger men in the electric communication services have joined either the American Institute of Electrical Engineers or the Institute of Radio Engineers. The former has a membership of about 11,000 and the latter a membership of about 2,000.

Subscribers of TELEGRAPH AND TELEPHONE AGE, or others engaged in wire work, who wish to join either of these important societies should write to the editor of this journal for application forms.

FRANK R. WILLIAMS, superintendent of fire alarm telegraphs at Elizabeth, N. J., was fatally injured by a falling tree, on April 12. He had been in charge of the fire and police systems of Elizabeth during the past seven years.

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WESTERN UNION TELEGRAPH COMPANY.

T. W. CARROLL, general manager, Eastern Division, is on an inspection trip to offices in New York State.

R. O. JONES, general inspector, traffic department, New York, is at Rawlins, Wyo., installing new type repeater equipment on overland multiplex circuits.

ON A MULTIPLEX triple-channel circuit between New York and San Francisco operating speeds of forty words per minute per channel are being maintained. The bulk of the press and special matter filed at Chicago and at San Francisco in connection with the national political conventions was handled by means of multiplex printer circuits.

M. F. BRIDGES, division inspector, Gulf Division, Dallas, Tex., is in New York, where he will remain during June and July, gathering operating and traffic ideas.

L. V. SCHUNDER is acting as division supervisor of equipment of the Gulf Division, Dallas, Tex., vice H. R. Monohan, deceased.

THE FIRST QUARTERLY 1920 report of the company shows a net operating revenue increase for January, February and March, as compared with 1919, of $2,522,921. For the month of March the increase was $641,643.

C. A. POSEY, during the past three years manager at Chattanooga, Tenn., has been advanced to the position of commercial agent for the Chattanooga district. M. A. Guthrie, assistant manager at Nashville, Tenn., has been appointed manager at Chattanooga.

A. E. BARKSDALE, assistant manager at Chattanooga, Tenn., has been transferred to the office of Superintendent Wilson at Dallas, Tex.

F. C. WILLFORD has been appointed assistant manager of the office at Nashville, Tenn.

CHARLES C. ADAMS has been appointed chief operator at Phœnix, Ariz., vice F. B. Biggert, furloughed.

New York Western Union.

AT A MEETING of the Morse Supervisors' Local, Association Western Union Employees, held on May 11, the following named were nominated for the offices stated: For president, J. P. Colery; vice-president, J. N. Kelly; secretary-treasurer, G. F. Preston; grievance committee, H. Howley and J. P. Shannon.

MORRIS L. HARNER of No. 24 Walker Street, on May 3 succeeded L. P. Tebeau as deputy vice-president of the Association Western Union Employees.

JOSEPH MCCOSKER, aged fifty-eight years, identified with the operating department for many years, and recently placed on the pension list, died at North Adams, Mass., June 7.

THE COMPANY has leased the entire fourth floor of the building at 139-149 Center Street, southwest corner of Walker Street, containing an aggregate of 11,000 feet of space. Growth in business requires additional office room.

First District, Eastern Division.

C. E. BUNTEN of the Kingston, N. Y., office, will have charge of the office at Fleischmanns, N. Y., during the summer months. During the vacation season this is one of the busiest offices in the Catskill Mountains.

ZELMA DONOVAN, formerly of Dobbs Ferry, N. Y., will handle the heavy summer file at Tannersville, N. Y., in the Catskills.

MISS C. E. HULL, manager at Hoosick Falls, N. Y., has returned from an enforced layoff on account of illness.

NAOMI WARD, formerly cashier at Ogdensburg, N. Y., was recently appointed acting manager at Oneida, N. Y., vice Ethel Rublee, who takes a place with a brokerage firm.

MISS E. M. FRAHER has been appointed acting manager at Saugerties, N. Y.

A CONFERENCE of officials and managers of the first, second and third districts of the Eastern Division was held at the Berwick Hotel, Newark, N. J., on May 18. Discussions relating to standardization of methods and continued improvement in service were participated in by those present.

Washington, D. C., Western Union.

CHIEF OPERATOR DEXTER'S office and the bookkeeping department have been moved from the Sloan Building to the sixth floor of the main office in the Commercial National Bank Building.

NELSON ROSS AND JAMES LEGETTE, two of our experts were sent to Chicago to lend a hand during the Republican convention.

A. KANODE AND W. E. LOCKWOOD, of this office, have been absent from duty for some months on account of illness.

OLD-TIME TELEGRAPH MEN now in government service in Washington include Charles T. Mixer, of the patent office, and William Dulin of the pension office.

ROBERT HECKMAN, of this office, who recently underwent a serious operation is reported on the road to recovery.

IRVING HARNE, president of the Association Western Union Employees, had the misfortune to lose by death his wife who died on June 8. The sympathy of the entire force is extended to Mr. Harne.

THE ASSOCIATION WESTERN UNION EMPLOYEES will give a dance, entertainment and social in the ball-room of the Raleigh Hotel on June 19.

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Boston Western Union.

A. STEVENSON, assistant chief operator, is handling a difficult situation with marked success. The large volume of business, the opening of summer offices, and a natural scarcity of experienced operators for all positions, imposes a world of responsibility upon those who do the planning to keep traffic moving.

L. W. PETERSON, one of our local engineers, has completed the instruction of a class of eight first class telegraphers in multiplex work, all of whom graduated creditably.

M. L. HODGSON, of this office, is receiving the congratulations of his associates upon the arrival of a daughter.

JAMES F. MADIGAN, night wire chief, has returned from his vacation, which he spent at Portland, Me.

A LARGE NUMBER of the ambitious young men in this office are diligently studying the Course in Technical Telegraphy now running in TELEGRAPH AND TELEPHONE AGE. When the first examination is held, in August next, the Boston students intend to stand high in the list.

H. R. MCISAAC, supervisor, and secretary of the Association Western Union Employees, Boston Local, has returned from his vacation which he spent in New York, Washington and Richmond.

S. E. DENHAM, supervisor, has been assigned to the night force, due to increase in business.

GEORGE MANN, supervisor, has gained quite a reputation as a fisherman. His visits to the deep waters generally result in excellent reports as to the catch.

Big Entertainment in Boston.

The Association of Western Union Employees gave an entertainment in Boston on June 5, which was, perhaps, the largest affair of the kind ever given by telegraph employees in the east.

The offering had the quite modern title "Jazz and Follies," and was arranged and produced under the direction of George "Decker" Thornton. Nearly one hundred of the company's talented employees participated in the show.

The first act depicted the scene of a country club, the entire company appearing on the stage. All of the performers acted like professionals. Measuring by the applause accorded the individuals very favorable impressions were made by Harriette Wait, Johnny Russell, Josephine Sullivan, R. Dodd, J. McCarthy, Walter Iles, R. Newman and Joe Murphy.

A pony ballet participated in by six pretty and prettily costumed girls constituted a dancing specialty which was highly applauded. Miss Muriel Smullen, the little daughter of Ted Smullen, delighted the audience with her exhibition of toe dancing. Eileen Judge and Marion Smith combined their efforts and rendered a very fetching song, and Harriette Wait, with her song "Pip Pip Toot Toot" brought to her ears unstinted applause from all parts of the big hall. Other singers among the young ladies who shone as stars were: Dorothy Bott and Josephine Sullivan. Miss Sullivan took the part of an Irish colleen and her jigs were true to style.

Johnny Russell gave a high class exhibition of eccentric dancing, and Lawrence Thornton in his singing held the undivided attention of all present. Ralph Newman in a comic song made a hit that repaid him for the time he has spent developing his talent.

Perhaps the most attractive feature of the second act was a winter scene in which Johnny Kane scored a big success in a female impersonation. In this act a singing and dancing specialty entitled "Rosemary" was well rendered, and in the "Moving Picture Ball," Rhoda Cohan was a decided success. Lillian Brown in an impersonation of Ann Pennington gave an exhibition that would have been a credit even to Miss Pennington herself. Jeannette Price led a "Beauty Shop" number in which nine pretty girls took part, while Johnny Kane and eight other boys dressed as girls participated in the sketch.

Barney Molloy and Marion Pova gave a song and chatter vaudevillee sketch while Dan McCallum and his Egyptian girls in "Dardenella" made a pretty picture which was highly applauded. Gertrude Brinnick and Joe Murphy, with the modern dancers, rendered a sketch which was heartily applauded.

The entertainment was given in Jordan Hall. The Committee on Arrangements was composed of Louis D. Klubock, chairman, and Messrs. James R. Hennessey, Agnes Gillen, Roger W. Dodd, Harriette Wait, Rhoda Cohan, Florence Conlon and Ethel Kerr. Thomas F. Galvin was stage manager; John J. Whelan, electrician, and the costumes were supplied by Custis and Weld.

The large audience which attended the performance included J. B. Rex, chief operator; A. Stevenson, assistant chief operator; W. G. Wetmore, traffic supervisor; C. F. Ames, superintendent; C. A. Crane, city superintendent; Mr. McAvoy, manager; George T. Dee, wire chief; John E. Fahey, president of the Association Western Union Employees, J. R. Hennessey, secretary treasurer of the Association, and their families.

President Fahey of the Association Western Union Employees is to be congratulated upon the success of the show. The work done by Messrs. Thornton, Klubock, Hennessey, Dodd, and the Misses Cohan, Conlon, Wait, Gillen and Kerr, insured success from the start.

IN GUATEMALA, South America, authority has been granted for the construction of a new telegraph line between the city of Guatemala and the port of San Jose.

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Western Union, Lake Division.

A. E. SACHS has been appointed manager of the office at Bloomington, Ind.

GLEN MILLER, manager of the Jackson, Mich., office, has been granted a furlough. He is being relieved by J. E. Riley.

J. O. ELLISON, for some time past chief clerk at Detroit, has been appointed supervisor of branch offices, vice Frank E. Bradley, resigned. Wallace Gray, formerly in the service at St. Paul, Minn., has been appointed to succeed Mr. Ellison as chief clerk.

A. C. KAUFMAN, general commercial agent, New York, and C. J. Eldridge, division commercial agent, Chicago, conducted a meeting of State managers and local office managers, at the Charlevoix Hotel, Detroit, May 11 to 14.

S. S. POWER, commercial agent, attended the Republican convention at Chicago.

EULA FITZGERALD, formerly of the manager's office, Dayton, Ohio, has been transferred to Detroit, where she will be a member of City Superintendent Burr's staff.

MILDRED POVEY, from Dayton, Ohio, has been appointed manager of a branch office in Detroit.

A. C. CRONKHITE, general manager, Lake Division, reports that the series of meetings held in the principal cities of the Division during the month of May were very successful. The enthusiasm displayed in taking up new ideas looking to increased traffic already has had far reaching favorable results

Western Union, Pacific Division.

THE REPEATER STATION heretofore at Winnemucca, Nev., has been moved to Elko, Nev. E. M. Sommers is in charge as wire chief.

ANGELES CAMP, CALIFORNIA, office has been reopened with Mrs. L. Crutsinger in charge as manager. She was formerly located in Tonopah, Nev.

J. G. CLINE, after his return from overseas duty, assigned as operator at Merced, Calif., and later at San Jose, Calif., has had to give up his place to undergo treatment on account of infection from shrapnel wounds in one of his arms.

A. H. MAY, superintendent of the first district, Pacific Division, recently held business meetings at Oakland, Reno, Sacramento and Redding. Managers from other offices in the district attended the meetings.

OFFICES in the Sierra Mountain summer resorts are being opened for the coming season. Already offices have been established at Tahoe Tavern, Truckee and Feather River Inn.

M. T. COOK, general manager, accompanied by other division officials, visited offices in Los Angeles, Calif., and Portland, Ore., recently. In both of these districts important commercial development meetings have been held recently under the direction of Division Commercial Agent Newsom and the district superintendents.

JOE PENUELAS, messenger No. 2 of the Douglas, Ariz., office won two valuable trophies at a bicycle race held in that city on May 2. In a boys' race he won first place by covering the ten-mile course in 27 minutes, 15 seconds. He also won the capital prize for the boy making the fastest time in all events. He learned to be a sprinter on long runs with important telegrams.

ON THE OCCASION of the Idaho State Republican Convention, held at Cœur d'Alene, recently, City Superintendent Jones of Spokane, Wash., who was on hand to assist Manager Boskill in handling the large file of telegraph traffic, took advantage of an opportunity to relieve a slight congestion due to wire failure, by transferring some of the press file to Spokane office by aeroplane. Mr. Jones personally made the trip and covered the thirty-five miles in thirty minutes.

WILLIAM J. SMITH, city suprintendent at Seattle, Wash., presided at the Father-and-Son Banquet recently held in the Masonic Temple, that city. The gathering was attended by one thousand fathers and sons, and a very interesting and appropriate program was carried out. Chief of Police Joel F. Warren, who has attended these affairs regularly in the past was, as is usual, accompanied by two fatherless boys of the Western Union messenger force.

WILLIAM MORRETTI, a messenger boy employed in the Seattle office of this company, died recently, following an operation for cancer. Ascertaining that the deceased was without funds or known relatives at the time of his death, General Manager M. T. Cook authorized payment of the funeral expense, and approved arrangements which provided a very respectable burial. City Superintendent Smith and twenty employees of the commercial department attended the funeral. Mrs. A. L. Smith, main office receiving clerk, furnished appropriate music. Six uniformed messenger boys were the pall bearers.

THE TARIFF BOOK does not contain reference to all the offices the Seattle office receives telegrams from. The Seattle office of the Western Union Company recently handled a dispatch which originated at some barren spot in the arctic region. The dispatch was from Roald Amundsen, the noted explorer, and was addressed to the exploration authorities at Christiania, Norway. The dispatch, dated November 25, 1919, reached Anadir, Siberia, very likely by courier, and from the latter point was transferred by radio telegraph to the United States Government station at Nome, Alaska. From Nome the message was relayed by U. S. Signal Corps land line and submarine cable to Seattle; thence across America to New York by Western Union service for further cable and land-line transmission to its destination. The dispatch, which has since been published in the press of the country, consisted of a several hundred word official report, advising of Amundsen's safety, and expressing the opinion that he would reach Nome in August of this year, whence, after a short stay, he would enter the ice around Wrangell Island, where he expected to be hemmed in by ice for a period of perhaps five years.

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Telegraph and Telephone Age

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A Post-War Development

Since the beginning of submarine cable laying, nearly seventy years ago, most of the cable used in laying deep-sea lines has been manufactured in England.

About thirty submarine cables connecting with other countries terminate at Atlantic, Pacific and Gulf of Mexico ports of the United States, and all but two or three of these were made in England. About twenty years ago the Germans tackled the problem of deep-sea cable manufacture and succeeded fairly well in producing a reliable product, and in the following fifteen years cables of German manufacture were laid in various parts of the world.

The only long submarine cable of American manufacture is that laid by the United States Signal Corps between Seattle, Wash., and Sitka, Alaska, sixteen years ago.

When the proposition was launched to lay a telegraph cable across the Pacific Ocean between San Francisco and the Philippine Islands, in the year 1901, it was at first stipulated that the cable should be made in America, but investigation disclosed the fact that none of the American manufacturers of cable was in a position to produce long lengths of submarine cable of a type necessary in deep sea work, so the order had to be placed in England.

Elsewhere in this issue of TELEGRAPH AND TELEPHONE AGE is published a letter written by George Gray Ward, vice-president and general manager of the Commercial Cable Company, addressed to Senator W. L. Jones, chairman of a committee considering the matter of a Government Pacific cable. In this letter Mr. Ward makes the point that the old cry of British monopoly of the gutta percha market is somewhat of a bogey.

It is true that American manufacturers have produced in large quantities cables used in telegraph and telephone work where the cables were to be laid in rivers and harbors, and if the gutta percha necessary in the make-up of long cables is available to American manufacturers, there must be other factors which enter into the situation in a controlling degree.

Is it a question of instability of labor? Lack of expert workmen? Low return on investment compared with that immediately in view from other products? Or is it lack of enterprise?

Possibly the advent of, and the rapid strides made by radio communication during the past twenty years has operated to deter wire manufacturing companies from making the large additions to plant and equipment necessary to engage in submarine cable making, but the fact that additional long cables are now being laid and others contracted for abroad should point to the conclusion that cables will be used for many years to come, notwithstanding that wireless service is destined to expand and carry an ever-increasing load of traffic.

One of the most definite post-war developments of the late conflict is that the American Government is determined to insure American ownership and control of lines of communication maintained in American territory. This is the phase of the situation which is new, and it follows that on all hands there is a desire that submarine cables laid by American companies should be of American manufacture.

There are bound to be interesting developments. We shall see how American manufacturers react to the situation.

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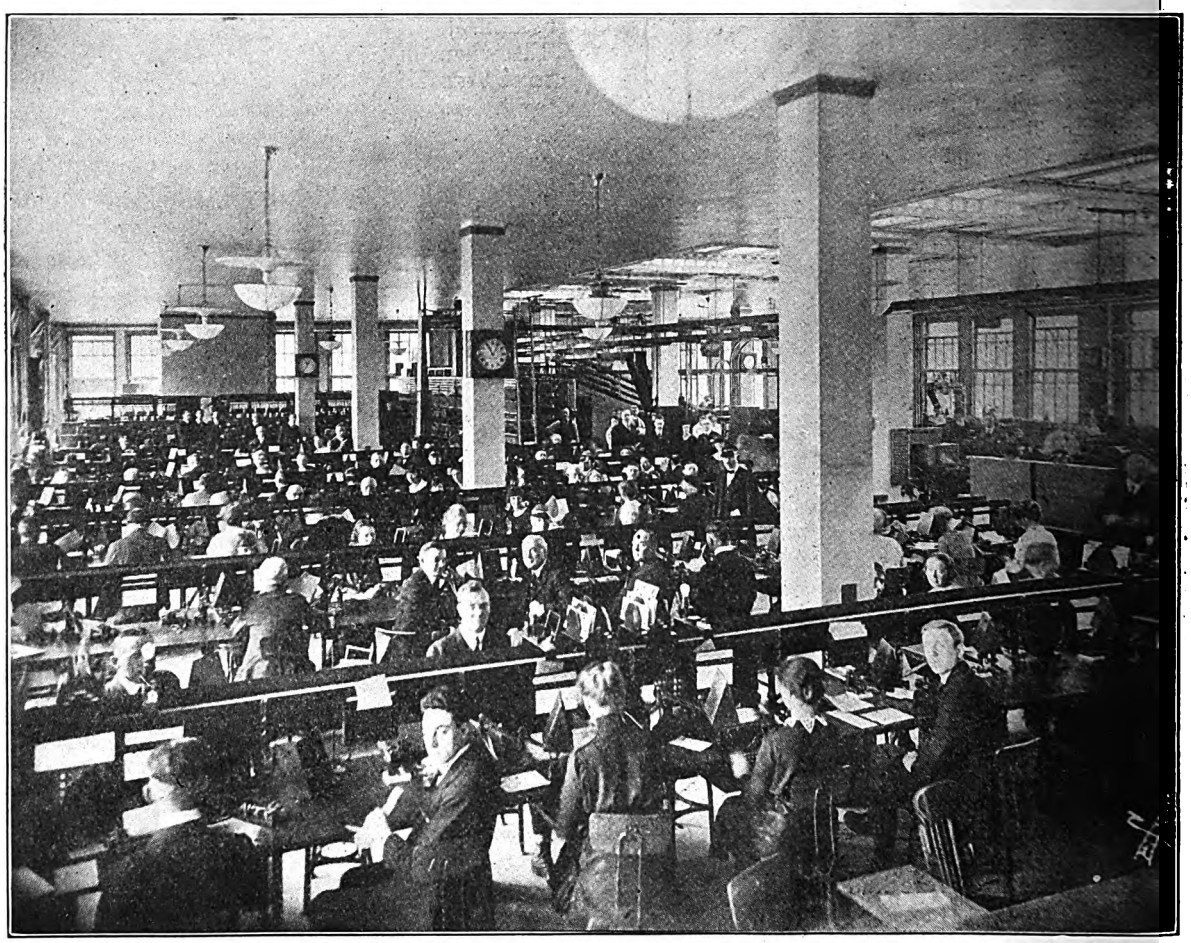
NEW OFFICE AT SAN FRANCISCO OF THE WESTERN UNION TELEGRAPH COMPANY

By S. M. Barr

The cyclone, sweeping everything before it, leaving ruin in its wake and knowing neither time nor place, is barely over before the news thereof goes humming over the wires to all parts of the world and aid for the destitute begins to pour in from all directions. A candidate for President is nominated in San Francisco in the morning and a few minutes later, the newspapers in New York City are announcing it in their extras. Twenty-four hours a day, each day of the year, the wires sing merrily as they move the country's business from the farm, the ranch and the plantation to the elevator, the packing house and the factory. Such is the service rendered the people by the telegraph—a service not to be surpassed in any country of the globe, a service backed with thousands of loyal men and women, organized into an efficient and well-directed force, with miles upon miles of wire strung through every nook and hamlet of our great country and with a tremendous and well-kept plant furnishing the best equipment that engineering skill can devise.

It was with this idea of service in mind that the Western Union Telegraph Company announced with pride the opening on May 1st of its new central office in San Francisco—and with pride well merited, for it was a "mighty task well done," a task which had to be accomplished before the National Democratic Convention began its sessions there in the middle of June, for this convention meant a heavy overload in addition to the immense volume of business usually handled by San Fran-



General View of Operating Room
Morse Department

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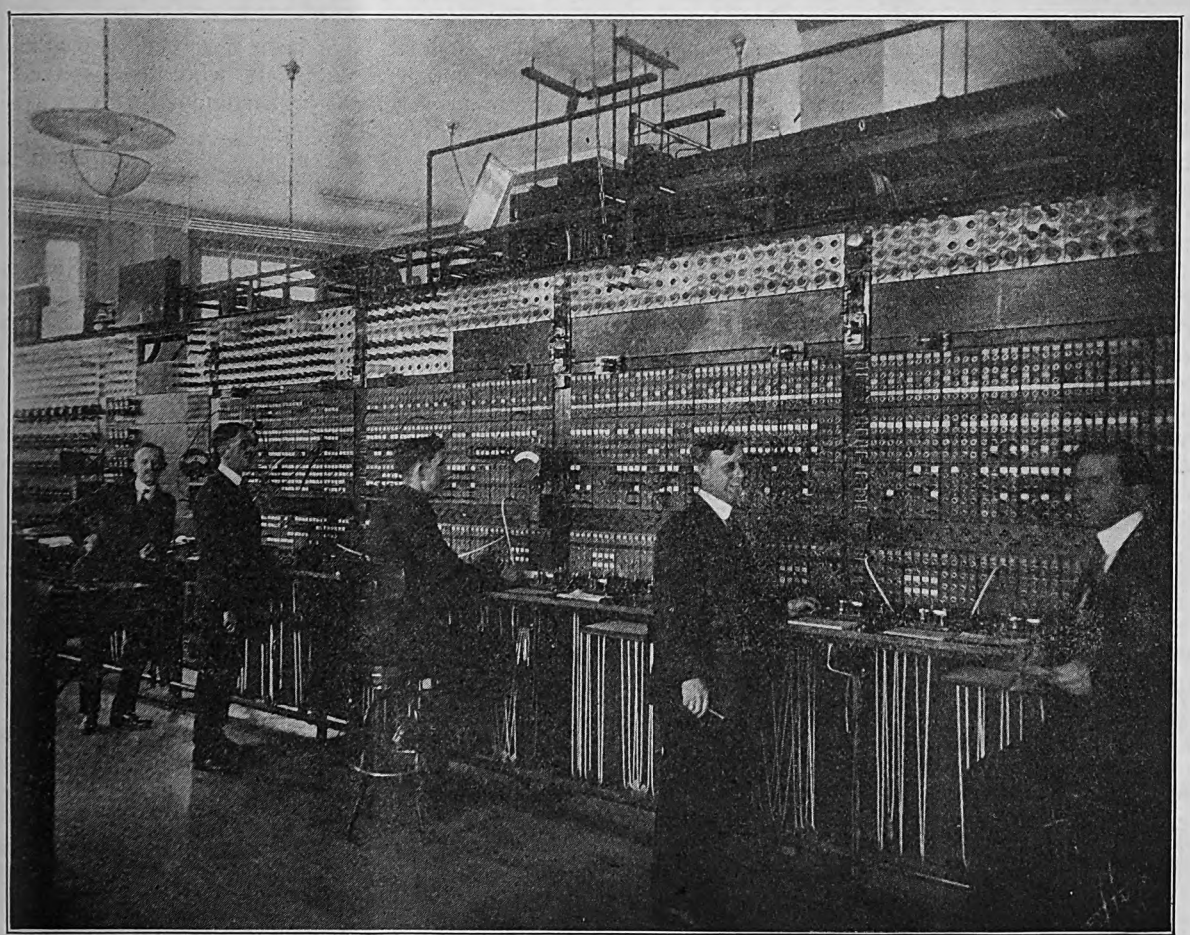
cisco—which ranks after New York and Chicago in amount of receipts. The task was rendered still more difficult by the fact that the greater part of the convention business would be long distance traffic, from 2,000 miles to Chicago, to 3,000 miles to New York, necessitating additional repeater stations along the way. It should be noted that the company strained every nerve and spared nothing to provide, in San Francisco, an office capable of affording efficient service when handling this immense volume of regular and convention business, and deserves the praise of the people at large, who are intensely concerned with the sessions of this convention.



MAIN SWITCHBOARDS

Realizing that proper working quarters are indispensable to efficient operation, the company arranged, in 1917, with the Bankers' Investment and Trust Company to build an entire new floor on top of their four-story building at 742 Market Street, which fronts on both Market and Geary Streets, and affords a large, well-lighted, well-ventilated, cheerful operating room. The building is located in the heart of the downtown business district, having adequate transit facilities to all parts of the city.

In laying out the equipment, the company's engineers gave due consideration to the light requirements, adequate fire protection, accessibility of operating positions, sufficient working space, methods of efficient handling of business, and proper maintenance of equipment.

The operating room is divided by the main aisle, running the length of the room. The north side is devoted to multiplex and the south to Morse positions, the tables extending from aisle to windows on each side. The nerve center of the office is located in the southwest corner of the room, in the form of a square, where, on the north side is the switchboard, consisting of three sections of main line, one of city and main, one loop and two of time service. The front of the board faces the inside of the square with the distributing frame parallel to it and at the rear. The power panel and motor generator bench are located on the west side of the square against the west wall and face inward so as to be visible to the attendants at the switchboard. The repeater tables, running north and south at right angles to the switchboard, occupy the inside of the square and are easily accessible to the board and power plant. This makes a compact and efficient layout, occupying a minimum of floor space.

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To eliminate the possibility of shutting down, due to power failure, separate leads have been brought into the building from two power companies, the Pacific Gas and Electric Company and the Union Gas and Electric Company. The former is used for regular service, and the latter for reserve. To change from one to the other requires but the throwing over of a three-pole double-throw switch located on the main power panel in the operating room, and accessible to the switchboard, repeater and power attendants.

To efficiently effect the interchange of messages from one portion of the office to any other portion, and from the operating room to the branch offices scattred throughout the city, a complete belt conveyor and pneumatic tube system has been installed. The pneumatic tubes run from the operating room, through a shaft to the basement and from there in wood ducts under the streets to the various branch offices. The compressed air is furnished by two feather-valve air compressors with a spare machine for reserve. These compressors are driven by 35 H.P. variable-speed motors, belt connected, with 15-inch idler pulleys riding loose on the 12-inch single-ply leather driving belts. The compressors are run at an average speed of 200 R.P.M. A pressure of 3 lbs. on the one side and a vacuum of 6 inches on the other are used for general operation. This type of compressor has been chosen because of its simplicity. The "feather" valves consist of thin strips of spring steel lying flat on the valve seat and operated by the pressure of the air, no auxiliary apparatus being necessary. They do not crystallize and break as do the poppet valves; require very little maintenance and are easily replaced at a negligible cost. They are quiet in operation and highly efficient. In this system both the pressure and vacuum sides are used, the former for sending carriers to the branch offices and the latter for bringing carriers from the branch offices.

The conveyor consists of an 11-inch 3-ply cotton belt running on ball-bearing rollers in an angle-iron guide and is operated by an electric motor. There is a conveyor on each operating table accessible from either side. Messages received by the operators are placed on these table conveyors, which discharge them into "pick-up" conveyors, which, in turn, carry them from the table belts to the distributing center. These "pick-up" conveyors run at right angles to the tables, along the north and south walls. At the distributing center, located in the northwest corner of the room, the messages are sorted. Messages to be relayed on other wires are delivered to them by means of delivery conveyors, which discharge them into adjacent drops from which point they are carried out by check girls. Messages to be delivered by telephone are sent to the telephone room on the floor below by belt conveyor and gravity drop. Messages to be delivered from branch offices are first sent to the tube routing center by belt conveyor, where they are sorted into pigeonholes and then loaded into carriers and placed on conveyors which carry them to drops under their respective tubes. A check boy loads these carriers into the various tubes which carry them to the branch offices. Messages received over the telephone are sent up to the distributing center by belt conveyor. Messages filed at branch offices are sent to the tube center by tube. The carriers discharge into a slow-moving belt which carries them to a box at the end of the tube receiving table, where they are unloaded and the messages placed on the adjacent pick-up conveyor, bringing them to the distributing center, where they are routed to their destination. The empty carriers are placed on another conveyor, which delivers them to the tube routing center noted above.

These systems have been designed and installed by the company's engineers who have spared no effort to provide that high standard of service demanded by the management.

There are forty-seven channels of Multiplex and one hundred and twenty-six Morse positions required to handle the load. It is interesting to note that the multiplex circuits are the longest in the country, as can be readily perceived when one reads their names as New York City and Washington, D. C., a distance of 3,000 miles, Chicago and St. Louis, a distance of 2,000 miles, and Denver and Dallas, 1,500 miles.

To provide for the telephone requirements, two sections of P. B. X. board, five sections of telephone-telegram recording board and sixty delivery positions were installed.

When one considers that one million eight hundred thousand messages pass through this office every month and each consumes not more than two and one-half minutes from the time it is received on one wire until the time it is relayed on another, or if sent in from a branch office is handled with equal expedition, then one realizes the truth of a "mighty task well done."

Adjacent to the operating room on the fifth floor are comfortable rest rooms for the men and women, a convenient lunch room and a hospital room with a trained nurse in attendance.

The division offices are located in the same building, affording opportunity for close co-operation between the various departments.

Briefly, this modern office, utilizing the services of 1,200 employees, incorporating in it all the latest developments in the science of telegraphy, providing cheerful, commodious work rooms, cozy, comfortable rest rooms, a convenient lunch room and absolutely fireproof and safe in its every detail, is another link in that chain of service which the Western Union is forging for the welfare of the public.

IN JULY the price of a Government one hundred dollar Savings Certificate is $83.60.

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SOME CANADIAN TELEGRAPHERS

Including Some of Those Who Crossed The St. Lawerence and Became Americans.

By William Clark

When the Union Pacific, Great Northern, and Sante Fe Railroads were first manned with telegraphers it seemed that about half the operators who filled the tank-town jobs had learned the business at LaCrosse, Wis. There was a railroad depot agent at that little city who as an educator had the Plattsburgh Camp graduation averages shaded by a large margin. After a while it reached a point where a new man was not asked where he came from. He was more likely to be asked such a question as: "How did you leave Fat Smith?" or, "Did they ever finish painting the high school?"

George D. Perry
General Manager, Great North Western Telegraph Co., Toronto, Ont., President, Old Time Telegraphers' and Historical Association.

In Canada, Montreal and Toronto; to say nothing of Dundas, Ont., or Prescott, Ont., turned out more telegraph operators than Miquelon Island turned out fishermen. And, it was well that in the early days the best of the city's and the town's young fellows looked favorably upon the promises of a telegraph career; for, the history of telegraphs, telephones, railroads, and industry generally, shows that thousands of youngsters who started as telegraph operators later became the motive geniuses who carried to success these enterprises.

The occasion of the gathering at Toronto the latter part of August next, of the members of the Old Time Telegraphers and Historical Association makes it timely to give a little space to a review of the names of some Canadian telegraphers, including some of those who migrated to the United States, and who in the time of their adopted country's need constituted a bulwark of loyalty which effectively offset the efforts of immigrants from other climes to block the nation's rightful destiny.

Canadian Captains of Industry Who Started as Telegraphers

Some of the big business men in Canada who gained their elementary commercial education while working as telegraph operators are: E. R. Wood, president of the Dominion Securities Corporation; Thomas Ahearn, president of the Ottawa Light, Heat and Power Co.; Warren Y. Soper, president of the Dunlop Tire Company; John J. Seitz, president of the United Typewriter Co., of Canada; Charles R. Hosmer, director of the Canadian Pacific Railroad; Edson L. Pease, vice-president of the Royal Bank of Montreal; Thomas Findley,

Thomas Ahearn
Ottawa, Ont.

president of the Massey-Harris Co., of Canada; George A. Cox, president of the Canadian Bank of Commerce; P. J. Lally, the Lacrosse king of Canada, and J. J. Ahearn, electrical magnate of Ottawa. Of course, practically all of the officials of the telegraph companies, and many of the officials of Canadian railroads, started their business careers as telegraph messenger boys or as telegraph operators; but the readers of Telegraph and Telephone Age very likely are already familiar with the names of these gentlemen.

American Telegraphers Who Came From Canada

It is hardly likely there is available anywhere a complete list of the telegraphers who came to the United States from Canada, but from various sources the writer has collected the names of the more prominent of these men, and although in a few cases persons mentioned were born in the British Isles, all of them learned telegraphy in

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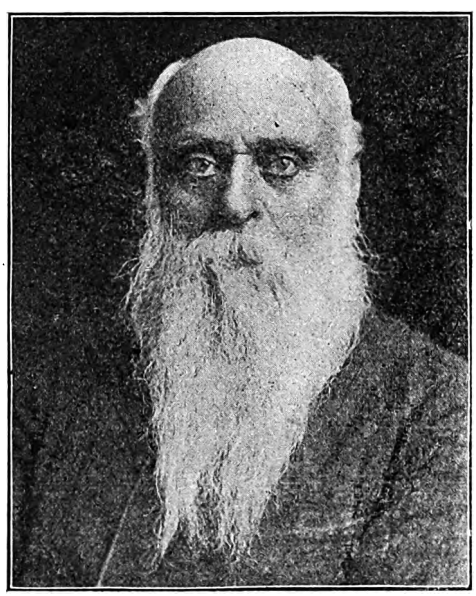
Canada before coming to the United States. Also, inasmuch as the record covers a period of thirty or forty years, it is obvious that some of those mentioned have passed on to other spheres, but in the majority they still are on duty and are doing creditable work wherever located.

So far as the personal welfare of telegraphers is concerned, one of the most helpful of the immigrants from the north was E. F. Howell, who came from Nova Scotia, and who from the first years of his service in New York took an active part in promoting and carrying on telegraphers' savings societies and telegraphers' insurance associations. Mr. Howell died a few months ago and was mourned by thousands of telegraph employees in all parts of the country.



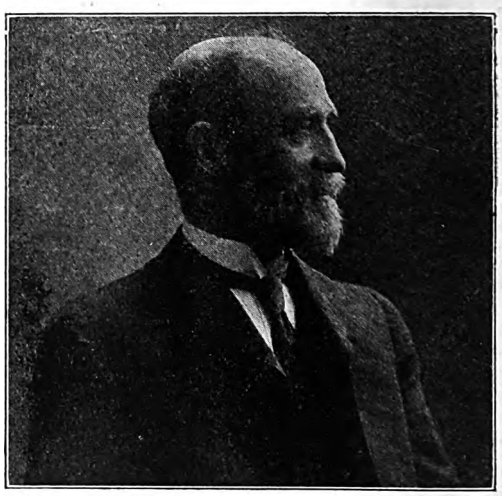
JOHN HORN
Montreal, Que., Canadian Telegraph Historian

Space will not permit saying much about the achievements of the telegraph men whose names appear in this little sketch. For the present, brief references will have to suffice.

Walter C. Burton, ex-New York State Senator, and present postmaster at Brooklyn, N. Y., learned telegraphy at Dundas, Ont., and came to New York in the year 1882, in the course of time becoming chief of the Race Bureau telegraph service of the Western Union Company. About twenty years ago he entered public service and during the intervening years has occupied many honorable posts.

S. H. Flagler, secretary of the Standard Oil Co., of New Jersey, is an ex-Canadian telegrapher, as is M. O. Hoffman, in charge of the Standard Oil Company's telegraph service in New York. George V. Hobart, the famous playright, telegraphed in Nova Scotia before coming to New York, and M. W. Connelly, editor of the Memphis, Tenn., *Commercial Appeal,* came from Canada to take up a telegraph position in the States. Other Canadians who, after serving as telegraphers south of the line for short periods, later entering other pursuits, were: Charles Dean, correspondent at Milwaukee, Wis., for the Associated Press; Peter M. Collins, land attorney at Helena, Mont.; F. W. Cushing, Western hotel magnate, and James R. Calder, manager of a large advertising concern in Minneapolis, Minn.

In the employ of the Western Union Telegraph Company the following ex-Canadians served during certain periods—some of them years ago, and others still in the service: The late A. G. Saylor, general superintendent at New York, and his brother, E. B. Saylor, superintendent at New York; I. McMichael, superintendent at Minneapolis, and later general manager of the Great North Western Telegraph Company, Toronto, Ont., where he died a few years ago; T. W. Gould-



EDWIN POPE
Quebec., Que., Superintendent, Canadian Government Telegraph Lines

ing, of the Western Union cable service; the late W. B. Somerville, superintendent of Western Union press service, New York; Thomas D. Carroll and Fred E. Chaffey, at Pittsburgh, Pa.; John Gaul, at one time chief operator at Pittsburgh; J. W. Booth, at one time chief operator at Salt Lake City, Utah; John F. Book at Chicago; J. W. English, in the auditor's department at New York; W. R. Chapman, superintendent at St. Paul, Minn.; George E. Sharp, superintendent of plant at Cleveland, Ohio; T. A. McCammon, New York; H. J. Jeffs, superintendent at Seattle, Wash.; F. B. Travis, city superintendent at Milwaukee, Wis.; F. C. Cole, superintendent at Seattle, Wash.; G. W. Lloyd, superintendent; O. J. Nourse, of the traffic department, New York; F. J. Dayman, chief operator at Cleveland, Ohio, and A. D. Campbell, manager at Spokane, Wash.

The Postal Telegraph-Cable Company has had two chief engineers who learned telegraphy in Canada; namely, E. T. Barberie and Francis W. Jones, and in the engineering offices at New York four other ex-Canadians have been employed for many years past. They are: John F. Cleverdon.

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Donald McNicol, Rufus Gould and John T. Needham. Mr. Needham is now the owner of a pneumatic tube business supplying carrier systems to the telegraph companies. The Postal has also had two general superintendents at Chicago who learned telegraphy in Canada—the late L. D. Parker, and E. W. Collins, the present incumbent. L. W. Storror, for many years general superintendent at San Francisco, is an ex-Canadian. The company's first chief operator at Washington, D. C., M. Duperow, came from Toronto. C. E. Bagley, superintendent at Philadelphia, was born

W. J. CAMP
Assistant Manager, Canadian Pacific Railway Telegraphs, Montreal, Que.

in Nova Scotia, as was John Doran, superintendent of the complaint and claim bureau, New York. Others in the Postal's employ who are ex-Canadians, are: John Annand, manager at Portland, Ore.; Stanley Newton, chief operator at St. Louis,

L. S. HUMES
Montreal, Que., Superintendent, Great North Western Telegraph Company

Mo.; Ed. Rankin, chief operator, New York; F. N. Roberts of the Chicago office; H. C. Bunting, late night chief operator at Seattle, Wash., and the late Joseph Sullivan of the New York main operating room.

INVENTORS

Ben B. Toye, the inventor of the Toye repeater, was a Canadian telegrapher, as was Leggo, the inventor of the chemical automatic telegraph system used on the early lines of the Postal Telegraph-Cable Company. Alexander Graham Bell, the inventor of the telephone, came from Canada, and Thomas A. Edison would have been a Canadian, if his parents had remained in Ontario a few months longer. E. H. Colpitts, assistant chief engineer of the Western Electric Company, New York, inventor of many telegraph, telephone, and radio devices, came from Nova Scotia. James Uncles, manufacturer of keyboard transmitting machines, also worked as an operator in Canada.

WALTER C. BURTON
Postmaster, Brooklyn, N. Y.

FAST SENDERS

Among the many high-speed Morse senders who came from Canada may be mentioned A. P. Velie, of the Associated Press; E. H. Curlette. Edward Curry, Thomas Curry, C. M. Oliver, and W. M. Gibson—the latter winner of the Carnegie diamond medal in the 1903 National Tournament.

RAILROAD MEN

Railroad officials employed on lines in the United States, and who in their younger days learned telegraphy in Canada, include E. E. Dildine, superintendent of telegraph, Northern Pacific Railroad, St. Paul, Minn., and J. H. Johnson, assistant general superintendent of the same company: Also, George D .Hood, superintendent of telegraph of the Chicago, Rock Island and Pacific Railroad, Chicago; L. S. Wells, superintendent of telegraph of the Long Island Railroad, New York; C. B. Davison, of the C., St. P., M. & O. Ry., St. Paul, Minn.; J. E. Mullin, E. P. Sievers and John Stephenson of the Soo Railroad; Eugene Duval, general Western agent of the C., M. & St. P. Railroad; O. O. Mercer, of the same company, and G. R. Clarke of the Great Northern Railroad.

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Writers of Telegraph Literature

Among the writers of books on telegraphy and editors of telegraph journals published in the United States, and who came to the United States from Canada might be mentioned James D. Reid, Thomas D. Lockwood, William Wallace, Jr., William Maver, Charles Thom, Donald McNicol, A. C. Terry and John F. Mackie.

Telephone Officials

A large number of the early telegraph chief operators went into the telephone business when telephone lines began to spread over the country, and some of the ex-Canadians took up that line of work. Among these the following ex-Canadians were numbered: William E. Bell, superintendent of the American Telephone and Telegraph Co., Detroit, Mich.; John K. Butler, superintendent of the New England Telephone and Telegraph Co.; Frank W. Conn, superintendent of the New York and New Jersey Telephone Co., and George Cameron, superintendent of construction for the New England Telephone and Telegraph Co.

Labor Leaders

Among the ex-Canadian telegraphers who became active in labor circles in the United States old-timers will remember David B. Mitchell and Thomas Allen. Of the later leaders Sam J. Small learned to telegraph at Dundas, Ont., and H. B. Perham, late president of the Order of Railroad Telegraphers, worked in Canada for a few years after arriving in America from England.

Radio Inventors and Engineers

Reginald A. Fessenden, inventor of many of the most useful radio systems and devices, was born in Canada. Roy A. Weagant, late chief engineer of the Marconi Company, and now consulting engineer of the Radio Corporation of America, came to New York from Canada, as did A. Reoch, assistant chief engineer of the Radio Corporation.

As stated in the beginning of this article, it has been possible to refer to but a few of the men who learned to telegraph in the Great Dominion, but the line-up here attempted may serve as a basis for a more complete listing to be made later on by someone else.

When the members of the Old Time Telegraphers and Historical Association meet in Toronto, August 31, and September 1, 1920, undoubtedly many of the telegraphers whose names are mentioned herein will be on hand to exchange experiences with old-time friends of the key.

Telegraph and Telephone Life Insurance Association

Assessments have been levied to cover the payment of death benefits to the families of W. H. McKeldin, Edward P. Adams, Richard L. Boyer, James Clandinan, Thomas F. Flynn, Pauline I. Ryder, Nicholas J. Prendergast, Charles F. Towers and John J. Smith.

Do You Qualify For a Raise?

"I know I'm worth forty dollars a week," complained Bronson to the Boss; "because you pay Wadsworth forty, and I'm just as good a man as ——."

Just then there came a resounding crash from the street below. The Boss jumped to his feet. Find out about it!" he commanded Bronson.

Bronson left without delay and returned with this information: "Some truck ran into one of our trucks."

"Whose truck was it?" urged the Boss.

Bronson said he would find out, and at the end of seven minutes came back to advise, "One of Dorsey's."

"Who was at fault?" urged the Boss with some heat. Again Bronson was gone, for five minutes, and he reported thus: "Dorsey's man was at fault."

"Won't you be seated," said the Boss, with a trace of sarcasm; and he rang for Wadsworth.

"Wadsworth—an accident has just occurred in the street below. Find out about it, please."

"Yes, sir!" said Wadsworth.

Only that: "Yes, sir!"

When he returned in five minutes he had this to say to the Boss and to Bronson:

"One of Dorsey's young boys backed a truck into the truck that 'Mike' Bannon drives. It broke one of the wheels off our truck, but the horses did not run. Mr. Dorsey admits it was his boy's fault and says he will foot the repair bill. The horses were not hurt; no one was hurt. Bannon has hitched his team to one of the reserve trucks, and there will be no delay in the shipment."

"Thank you!" said the Boss.

And when Wadsworth withdrew: "There's your answer, Bronson. When you can look me in the eye and tell me you're 'just as good' a man as Wadsworth, come back for that raise."—*Thermoid*

Equality for All

"Equality for all"—when as a matter of fact, in all nature and in all history, and as far as we know, in the life to come, there is no such thing as absolute equality. It is as ridiculous for men to desire and struggle for equality in limousines, libraries and Carots, as to demand equality in length of noses, color of hair or avoidupois. * * * There is one equality and one equality only, due every human being—that is equality of opportunity. Equality of opportunity to secure what each individual man needs, not what he thinks he needs because others have it. This distinction is missed by many on both sides of the senseless struggle between capital and labor. * * * Let us get down to the equality of opportunity platform. Its planks are few, but strong enough to support the world, if one half of the money spent in agitation and protection could be put into education, the first step in solving the problem of equality would be made.—*N. Y. Commercial.*

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser"

(*Continued from June 16 issue*)

Most submarine telegraph cables are operated duplex. That is, one message is transmitted in each direction simultaneously. The speed of transmission in a given direction is reduced from 10 to 15 per cent. when a cable is duplexed, from which it is evident that by duplexing the circuit there is a net gain in words per minute of between 85 and 90 per cent.

The original cable receiving apparatus consisted of a mirror galvanometer. A tiny circular mirror with steel magnetized needles attached was suspended by means of silk fibers in the center of a bobbin wound with many convolutions of a small gage wire. The rays from a stationary lamp falling upon the mirror were reflected upon a scale. and as the mirror moved to the right or the left

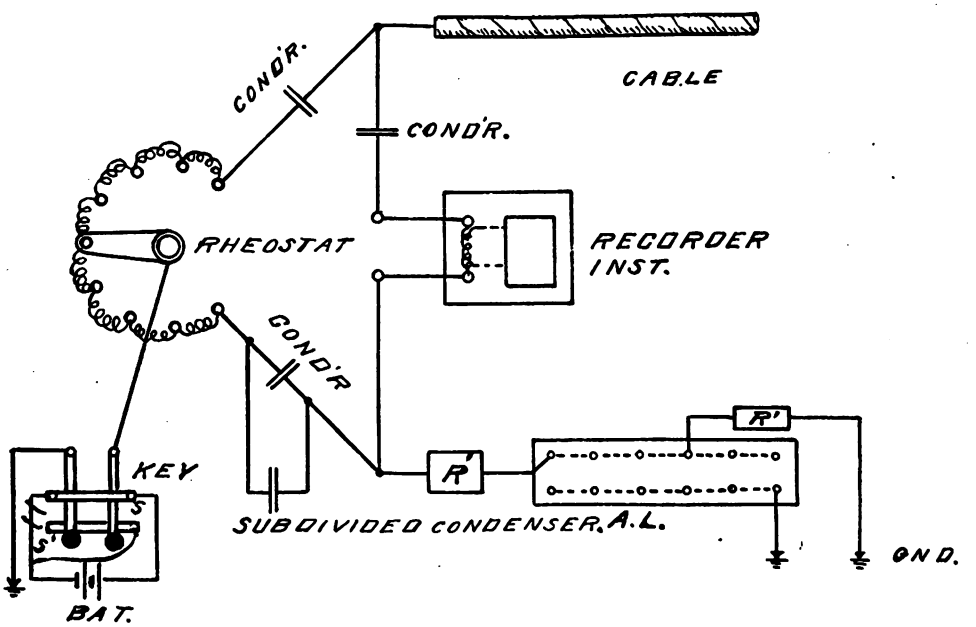

Fig. 6

The accompanying illustration shows a typical cable terminal hook-up for duplex working. Transmission is by reversal of current and reception is by means of a siphon recorder. The Continental telegraph code is used and the dots and dashes are made by contacts of equal duration—the dots being made by one polarity and the dashes by the opposite polarity of current. When transmission is not going on the cable conductor is normally connected to earth through the apparatus connected therewith.

On account of the low potential used, and due to the large electrostatic capacity of the cable, the strength of the received current is small—from one to five milliamperes—and will not actuate any ordinary type of electromagnetic relay. The siphon recorder, while electromagnetic, operates on a different principle from relays with armatures which are required to close contact points.

in response to incoming currents the reflected light beams were read by the cable operators and translated from Morse code signals into words and messages.

Later, the mirror galvanometer was supplanted by the siphon recorder which produces an easily read wavy line on a moving band of paper tape. The recorder was invented by Sir William Thompson (Lord Kelvin), who also invented many other practical devices used in cable signaling. Many of Lord Kelvin's mathematical formulas and curves are still used in solving cable transmission problems.

In the early cables serious difficulty was experienced due to earth currents flowing into the cable. Earth currents and currents due to magnetic storms usually are in the nature of direct currents, so, taking advantage of this fact cable

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terminal circuits now include condensers as shown in the bridge arms, Fig. 6.

To Dr. Muirhead, of London, is due great credit for developing successful duplexing methods for submarine cables. Muirhead "artificial lines" are widely used in cable practice.

The diagram, Fig. 6, illustrates the theoretical wiring of a terminal set, including sending and receiving instruments. In many modern installations there is an additional local circuit known as a "magnetic shunt" connected between the point where the cable conductor enters the set and the point where the lower bridge arm joins the artificial line. The magnetic shunt consists of a certain amount of non-inductive, or "Ohmic" resistance connected in series with a given amount of inductive resistance.

The set comprises the sending key; the "apex resistance" known in service as the one-quarter ohm rheostat; the bridge, or block condensers; the sub-divided condenser; the sending and receiving condensers; magnetic shunt; recorder, and artificial line. In the disgram the apex resistance is shown in somewhat circular form. It is made up of forty one-fourth ohm resistance coils and is

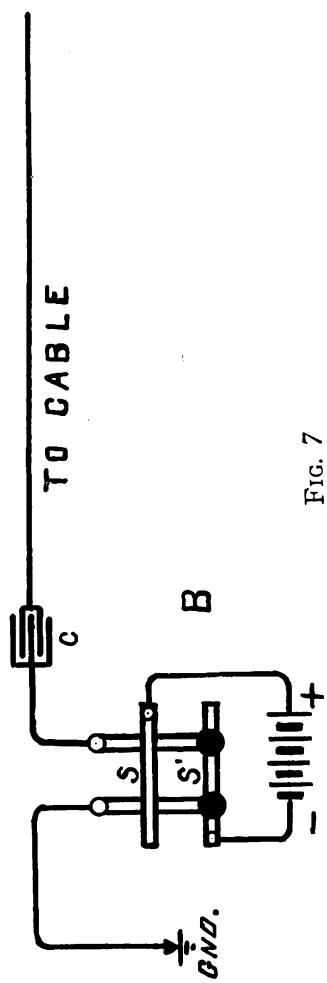

Fig. 7

used to regulate the charge of battery into the sending condensers.

The sending key is known as a double-current key, and in the diagram, Fig. 7, it is plain how depressing one of the key levers sends positive polarity into the cable. One key is the "dot" key, and the other the "dash" key.

Some cable operators are quite expert in manipulating the double-key. So much so that often the remark is made "He sends like an auto."

On cables operated at speeds higher than hand sending is capable of automatic transmitters are used. The automatic transmitter is operated by a weight-driven pulley or by a small electric motor. By means of a train of clock gearing a perforated paper tape is moved along through the transmitter, the holes in the tape allowing two "woodpecker" rods to automatically connect the positive and negative battery terminals to line according with the prearranged holes in the tape. The automatic transmitter may be run at any desired speed and operates continuously.

Balancing a Cable

To properly "balance" a submarine cable it is necessary to have the artificial line duplicate exactly the electrical condition of the cable conductor—that is, as to resistance and electro-static capacity.

The bridge, or sending condensers—the value of which vary according to the KR of the cable conductor being used in a given case—are made up of alternate layers of tin foil separated by layers of paraffined paper, the units generally being made so as to have a capacity of twenty microfarads each. The sub-divided condenser contains a total of three microfarads and may be adjusted to have a capacity of one one-thousandth of a microfarad.

The artificial line is made up grid fashion, having each alternate layer of tin foil connected with the neighboring sheet. In this way the factor of resistance is built up. As a rule, each artificial line box contains seven resistance terminals and six capacity or earth terminals. The electrical insulation of the condensers and artificial line parts is of the highest standard. Tests show the loss of charge of block and artificial line condensers over a period of one minute to average one-tenth of one per cent.

Lightning guards of various types are used in cable operation, such as the Lodge-Muirhead device; Siemens Plate, and Saunders' arresters. One terminal of the arrester is connected with the cable and the other with the earth.

The resistance shown at R in Fig. 6 is made up of units of various values, ranging from one ohm to 99,000 ohms.

The Siphon Recorder

The siphon recorder shown connected in Fig. 6 is made up of several component parts, and is so designed that the various adjustments may readily be made, and defective parts removed and replaced when necessary. In the main the instrument consists of a rectangular coil of fine insulated wire—about No. 42 B. and S. gage—suspended by silk or phosphor bronze threads and is arranged to swing

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freely and clear of the surrounding soft-iron core. The unit containing the coil, soft-iron core, and adjustments is termed the suspension piece. The coil is so arranged that it lies directly between the pole-pieces of a powerful horseshoe-shaped magnet, the pole-pieces of which are adjustable.

Attached to the suspension piece is a small aluminum cradle suspended between two supporting points by a stretched wire. Attached to the cradle is a fine glass siphon one end of which dips into an ink-well. The ink-well, cradle suspension and silk fibers all are adjustable for correct working.

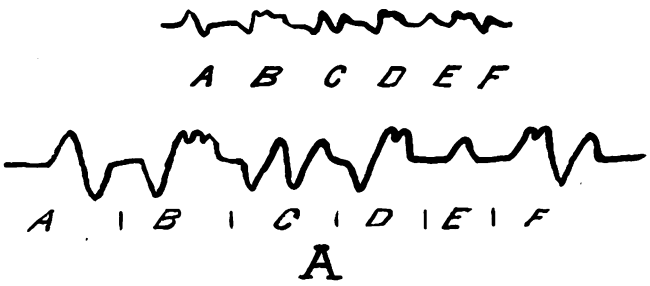

FIG. 8

The siphon is made to vibrate at a rapid rate against the paper tape. There are several different methods of accomplishing this. The idea is to nullify the effect of friction between the glass point and the paper. The ink line appears as a continuous series of closely following minute dots. Three types of vibrators used are the Muirhead, the Ash, and the Cuttriss.

In the management of the recorder there are various adjustments which in practice have been found to have material benefit. It is important that the points of attachment of the fiber to the coil should be equidistant from the center of the coil. The coil should hang squarely, and the proper adjustment of the coil suspension to the speed of signaling should be kept in view. The effects produced by too slack or too light suspension are very marked. Too much tension will give the signal a broken-backed appearance.

The paper strip is moved along by means of a small electric motor commonly called a "mouse-mill." The tip of the siphon touching or vibrating on the paper, before being placed in service, is ground by holding it in contact with a finely grained emery wheel revolved at slow speed.

In Fig. 8 is shown recorder markings of the first six letters of the alphabet—the lower trace made at slow speed.

(To be continued)

The Manufacture of Submarine Cable

(The following extract is from a letter addressed by Mr. George G. Ward, vice-president and general manager of the Commercial Pacific Cable Company, to Senator Wesley L. Jones, the chairman of a committee considering the matter of a Government Pacific cable. This extract will prove informing to many who have often asked why long submarine cables are not manufactured in the United States):

AMERICAN CABLE MANUFACTURE

American cable companies would be very glad to have their cables made in the United States, but it is noteworthy that during the more than fifty years of cable making and laying and the great development by American manufacturers of all other classes of industry, including the manufacture and laying of underground cables, they have never undertaken to develop plants to compete for the manufacture of long deep-sea submarine cables.

We agree with the statements that the manufacture of submarine cables does not involve anything of a mysterious character, and we are also in accord with the belief of those who have testified before the committee, that American cable manufacturers are quite capable of making suitable cables, but one naturally asks why this has not been done. With American genius for manufacture, with American enterprise, with plenty of American capital ready to engage in any project showing favorable prospects, why have the American cable manufacturers hesitated about developing submarine cable plants? It cannot be attributed to lack of support by the American cable companies. These companies could not support something that did not exist. A submarine cable is not like a piece of machinery. Its construction is simple but based upon scientific experience. It is laid in immense depths under great pressure, and when once submerged it is not recovered except to repair breaks. Unless the cable is absolutely perfect in construction it may quickly develop defects of insulation, prejudicial to its operation and impossible to remove. This was the case with one of the two long Atlantic cables not made in England. Whether it be the Government or private companies, they would naturally wish to be protected against such a contingency. Hence, like every new industry, the American cable manufacturers must be prepared to give proper guarantees until they have established the efficiency of their product. Another very important point to be considered is the cost of manufacture in this country as compared with England. Senator Edge very pertinently remarked upon General Squier's statement that the Commercial Cable Company would not lay

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a cable with ships flying the American flag; that this was natural "when we appreciated the fact that it costs about two-thirds to run an English ship as compared to an American ship under present conditions." That same principle is involved throughout, namely, not only the cost of running a cableship, but the cost of the manufacture of the cable and the cost of the ship itself.

The Commercial Cable Company is in sympathy with any legitimate movement for the protection of American industry, but we believe that the people in this country would vigorously oppose any measure to develop for private profit a particular branch of any industry out of the funds of the Treasury, especially such an isolated branch of industry as cable manufacture. Congress has endeavored to protect American industry against foreign competition by a protective tariff, but it would certainly be a new and very questionable departure from this principle to use the Government funds to enable one branch of an industry to compete with foreign manufacture.

A good deal has been said about the lack and difficulty of obtaining gutta percha in this country to enable American manufacturers to make submarine cables. This argument is fallacious. Gutta percha can be purchased in the markets of the East, and if American cable manufacturers had any serious desire of making gutta percha submarine cables, there is no reason why they could not go into the open market and buy this material the same as the British cable manufacturers do. We entirely agree with the testimony by Colonel Saltzman, to the effect that too much stress was laid on the fact that the supply of gutta percha of the world was controlled by one particular country. We have recently been offered over one hundred tons of gutta percha by an American concern. Colonel Saltzman further states that he has not the slightest doubt that if the problem was put up to any one of the big, reptuable firms in this country they would overcome that difficulty and get the necessary gutta percha to make a cable. There seems no reason why this should not be so. Hence, why should American cable manufacturers wait for an order from the United States Government for a gutta percha cable before they equip themselves to manufacture it? This certainly savors of paternalism, and it is entirely contrary to the enterprising character of American industry. One is forced to the conclusion that the cable manufacturers of the United States will not engage in the manufacture of gutta percha cables unless the United States Government previously agrees to keep them occupied with orders which will enable them to make cable at a considerably higher price than it would cost elsewhere. Let the American cable manufacturers make a good gutta percha cable and demonstrate by practical results that it will compare with European manufacture in cost and efficiency and they will find the American cable companies eager to patronize them.

The same may be said as to apparatus. Cable apparatus is very delicate, and must be made with great care and precision. This country is the greatest machine manufacturing country in the world, and there is no reason why they should not make good submarine cable apparatus if they devote sufficient interest to it, but the fact remains that they have not done so. The American cable companies have been compelled to go to England for most of their apparatus, and in spite of the great land telegraph systems in this country and the large number of instruments needed for their operation, there are no manufacturers of apparatus here who make certain classes of instruments as excellent in perfection and delicacy as those made in England.

Submarine cable operation and manufacture had its birth in England. It was sponsored principally by private capital. British cable manufacturers built large plants. They acquired special skill and experience in the manufacture and laying of cables, which assured purchasers of the security of their investment. The Germans also built a cable manufacturing plant; and so did the French. Neither the German nor the French companies has been successful in competing with the British manufacturers. Even in Germany, where the labor costs have been low, they have not been able to make a cable at a price to compete with British manufacture. The first cable laid by the German Cable Company across the Atlantic was manufactured in England. The French cable manufacturers made a transatlantic cable, but the experience is not one which would encourage unsubsidized capital to place orders with them.

The Commercial Atlantic and Commercial Pacific Cable Companies use a large quantity of underground cable for the operation of their lines in the United States, Honolulu, Manila and China. This cable must be made as efficiently as the submarine cables are made, except that in construction different materials are used. All of these underground cables have been manufactured in the United States.

The Alaska cables of the United States Government were made in the United States. We believe that these cables have not proven entirely satisfactory, and this seems to be borne out by General Squier's statement that the condition of the cable laid only fifteen years ago is precarious.

We quote a statement made by Admiral Bradford on January 30, 1900, when the laying of the first Pacific cable was being considered:

> "Referring to H. R. 930, I observe that provision is made in that bill for cables of American manufacture. I advise against that section. There is an exception which provides that the section between San Francisco and Honolulu, in case it cannot be manufactured in twelve months, may be purchased abroad. And, again, in No. 6766, there is a provision for the purchase of a foreign made cable in case one for that section cannot be manufactured in the United States within fifteen months.
>
> "The best cables are the cheapest. Tele-

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graph cables are now universally made in Great Britain, and the most expensive thing Congress can do is to lay across the Pacific an experimental cable. If a cable factory were established in this country its first products would be more or less experimental. I think that is patent to all. And after the cable proposed to be laid across the Pacific was manufactured the factory would be idle. I cannot see any particular advantage to be gained in establishing cable works in this country in view of the small amount of cable business done by this country. I would earnestly recommend the purchase of the best possible cable that can be made abroad.

"Cable making is not difficult mechanically, but requires much experience and knack and great care; even a pin puncture may ruin it. The reason that cables are operated so successfully abroad compared with what they were when first used is due to the improvement in their manufacture and methods of laying."

To summarize the foregoing, there are several arge wire and cable manufacturing plants in this country, and if they have not seen fit to compete with European manufacturers for long submarine cables, there must be a good reason for it, and the reason is not because the American cable companies have refused or would refuse to patronize them if they could manufacture a cable as efficient and at the same cost as a similar cable manufactured abroad.—*Postal Telegraph.*

NEW CABLE TO SOUTH AMERICA

Western Union Line to Be Open in September

The new Western Union $5,000,000 trunk cable, which will establish direct telegraphic communication between the United States and the principal ports on the eastern coast of South America, will be opened, barring accidents, early in September, it is officially announced by First Vice-President G. W. E. Atkins.

Electrically and mechanically the cable will be the most up to date ever laid, being the most impervious to injury and having a capacity of 50,000 to 60,000 words a day, or 200 to 250 letters a minute.

This modern cable, which will soon be brought to America from England, where it is now being manufactured, will be laid from Miami, Fla., to the Isle of Barbados, in the West Indies. At the same time the Western Telegraph Company of London will lay a new cable 1,500 miles in length from the Isle of Barbados to Maranham, in Brazil, making connection with the Western Telegraph Company's duplicate and triplicate lines, which have been operating from Para along the eastern and northern coasts of Brazil, touching at Rio de Janeiro, Santos, Bahia and Pernambuco and having its terminus in Buenos Aires.

Direct to Buenos Aires

Direct cable communication will be established from New York City to Buenos Aires, a distance of 7,000 miles, thus binding together at Barbados the two great cable systems. Messages will be sent between these ports in fifteen to twenty minutes.

Not only will it be possible to cable direct from New York to Buenos Aires on the eastern coast of South America, but by means of a transcontinental telegraph line across the Andes, communication will be established from the eastern coast with the principal ports on the western coast of South America.

The Western Union Company does not propose to stop here in its programme for increasing its lines of telegraphic communication, having recently secured concessions for laying a cable 3,600 miles in length, along the western shore of South America.

Anglo-American Telegraph Company

The three-quarterly interim dividends on the preferred and ordinary stock absorbed £157,500, and the directors on January 31st last paid the final dividend of 30s. per cent. for the year on these shares and on the deferred stock. These payments absorbed altogether £262,500, being the rent paid by the Western Union Telegraph Company for the year, equal to 3¾ per cent. on the ordinary stock, 6 per cent. on the preferred stock, and 1½ per cent. on the deferred stock. The balance at credit of revenue account (£68,822) includes £3,197 interest received, and the balance of £65,625 is available for the payment of dividends for the quarter to March 31, 1920.

THE CABLESHIP "RELAY," belonging to the All America Cable Company, arrived in New York on June 16, from Cuban waters. The ship has been on an eight months' trip to Central and South America repairing cables. Captain Edgar Oldham is in charge.

THE COMMERCIAL CABLE COMPANY has completed the construction of new storage sheds on Upper Water St., Halifax, N. S. It is stated the company is shortly to place in service an additional cableship, which will make Halifax its home port.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

And we can highly recommend it to our readers

$2.50 per copy

From TELEGRAPH AND TELEPHONE AGE

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Radio Telegraphy

Radio Corporation of America

E. J. NALLY, president, sailed for Europe on the *"Baltic,"* June 26, on official business which will take him to England and to several of the continental countries.

MAJOR CHARLES P. BRUCH, of the Pan-American Wireless Company, Buenos Aires, S. A., recently suffered a severe attack of grippe, but is reported recovering.

COL. CURTIS H. NANCE, of the Commercial Department, sailed for Venezuela on June 16, on company business.

Annual Meeting of the Radio Corporation of America

At a meeting held in New York on May 4, President E. J. Nally, of the Radio Corporation of America addressed the following report to the stockholders:

"As you have been advised through various circulars which were sent to all stockholders of the Marconi Wireless Telegraph Company of America, the Radio Corporation of America was organized under the laws of the State of Delaware in November, 1919, with an authorized capital stock as follows:

"5,000,000 shares of preferred stock of the par value of $5.00 per share. This stock is entitled to receive preferred dividends of 7% per annum and no more. In any distribution of the assets it is entitled to be paid off at par prior to any payment to the common shareholders. The preferred dividends are to be cumulative after the end of the Radio Corporation's. fiscal year ending in or with the calendar year 1923.

"5,000,000 shares of common stock without par value. The preferred stock and the common stock have equal voting power, share for share. The preferred stock may be retired on any day on which a dividend thereon shall be payable at the price of $5.50 per share and accrued dividends.

"The Radio Corporation has purchased the assets of the Marconi Wireless Telegraph Company of America for which there was paid to the stockholders of that company $10,000,000 in preferred stock and 2,000,000 shares of the common stock of the Radio Corporation.

"The Radio Corporation has entered into an agreement with the General Electric Company concerning present and future patent rights, the manufacture of patented apparatus and devices exclusively by the General Electric Company for the Radio Corporation, and the exclusive right to the Radio Corporation to sell patented radio apparatus and devices of the General Electric Company.

"The General Electric Company appropriated $2,000,000, a portion of which was used by the General Electric Company in purchasing the shares of stock which the Marconi's Wireless Telegraph Company, Ltd., of Great Britain, owned in the Marconi Wireless Telegraph Company of America, the remaining portion of this sum having been paid in cash to the Radio Corporation or expended or agreed to be expended directly for its benefit.

"In addition to the above, the General Electric Company contracted with the Radio Corporation to furnish to it certain 200 K. W. high frequency alternators known as the Alexanderson alternators, with accessories, at an agreed price to be paid for in preferred stock of the Radio Corporation at par.

"In connection with the agreement between this Company and the General Electric, it should be mentioned that your company not only gains business and financial prestige through its association with the world's greatest manufacturer of electrical apparatus, but also it brings to our commercial department the co-operation of that company's world-wide organization, and, what is probably the most valuable asset of all under the agreement—exclusive control of the Alexanderson alternator.

"This device bids fair to practically revolutionize the art of long distance communication by wireless. The report comes to us that the signal transmitted from our American stations equipped with the Alexanderson alternators has attracted the attention of the wireless experts of continental Europe. It is said they wonder what manner of device it is that sends a signal so noticeable superior to that to which they are accustomed.

"Already the British Marconi Company has adopted the Alexanderson alternator to be purchased from the Radio Corporation as its standard high frequency apparatus for communicating for distances exceeding 2,000 miles. Commissions or representatives of the Governments of Poland, Denmark, Sweden and other foreign countries have been sent here to investigate and examine it, with view to procuring sets for their stations. It is safe to predict that as a result of these investigations it will soon be conceded your company controls the world's foremost transmitting device for long distance wireless communication. The resultant advantages to the company, both financially and in the way of prestige, are readily apparent.

"In accordance with what is understood to be the wishes of the United States Government, effective means have been used to see to it that the actual control of the Radio Corporation shall at all times be in the hands of loyal American citizens or corporations.

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"A representative of the United States Government in the person of Admiral Bullard of the U. Navy has been designated by the President and ecretary of the Navy to attend the meetings of ır stockholders and Board of Directors, with view a close cooperation between the Government and e company. This interest on the part of the Govnment and its full accord with our program has ready proved helpful through gaining the assisnce of the State and Navy Departments in conection with certain of our dealings in European ıd South American countries. As our company xpands and its operation extends into various oreign territories, the harmonious working arranements between the company and our government ecomes more and more essential. It will therefore ontinue to be the policy of your officers and direcrs to strive to merit and retain the good-will and -operation of our Government.

"On February 29, 1920, the United States Govnment returned to the Radio Corporation its high ower stations, all of which had been taken over by e Government as a war measure upon the United tates entering the World War in April, 1917. otwithstanding the stations were returned to the ompany on only a few days' notice, your officers ıd anticipated the possibility of such an emerency, and were ready. The result was, uninterupted operation of the stations and immediate eadiness of your company to serve the public.

"Your Board of Directors has approved a large rogram of construction for the near future. It is roposed to immediately purchase a site near New ork City for a group station of five units, the staon when completed to be devoted to the following urposes: one unit to work with Buenos Aires, rgentine; one to work with France; one to work ith Germany; one to work with Scandinavia; and ıe with Italy and Poland.

"The expansion of your company into a worldide wireless communication system will not only roduce attractive returns from the communication affic, but will serve to develop a commercial enrprise that will take the equipment and goods of e Radio Corporation into practically every coun-y of the world. It presents commercial possibilis that can scarcely be calculated.

"Another field which is already making good rerns to your company and which will be further veloped, is that of supplying wireless equipment r vessels. Already over a thousand ships sailing der the American flag carry Radio Corporation paratus.

"There has recently been newspaper publicity out the U. S. Navy taking over all high power dio communication and the enactment of legislan prejudicial to the commercial interests, which ıy have been disconcerting to those stockholders ıo saw such reports. It would seem, however, re is a growing sentiment in favor of privately-erated wireless stations. While the Government ll continue to exercise supervision over interstate d transoceanic wireless communication, as it does er interstate traffic of all common carriers, and ll likely furnish commercial wireless service where privately-owned facilities are lacking or are inadequate, all indications point to the enactment of legislation that will foster and protect, rather than discourage and harm private commercial radio enterprises.

"On the whole, prospects for successful operations and satisfactory returns from both the communication and commercial fields of your company are encouraging."

CANADIAN NOTES

Great North Western Telegraph Company

The Great North Western Telegraph Company held its annual commercial conference at the Fort Garry Hotel, Winnipeg, on June 9th and 10th, at which the following representatives were present:

Guests: E. Kenward, supervisor of telegraphs, Canadian National Railways, Toronto; W. Girard, assistant superintendent electrical maintenance, Canadian National Railways, Winnipeg. Head office officials: Geo. D. Perry, general manager; Chas. E. Davies, traffic superintendent; J. F. McTaggart, travelling auditor; J. Sullivan, commercial supervisor. District superintendents: L. S. Humes, Montreal; W. G. Barber, Toronto; J. G. Davies, Winnipeg; G. H. Stead, Saskatoon. Managers: R. W. Ball, Calgary; G. W. Stevens, Edmonton; J. F. Middlemiss, Saskatoon; B. A. Boate, Regina; Miss M. McLeod, Moose Jaw; J. A. Rochon, Port Arthur; Miss L. Masey, Fort William; F. W. Lee, office manager; W. Russell and R. Gunn, branch office managers; B. S. Round, chief operator; Miss S. McNeili, chief clerk, district superintendent's office; G. Gottfred, inspector; G. McDonald, solicitor; R. N. McDougall, cashier; G. Wainwright, chief bookkeeper; W. Bradley, chief delivery clerk, Winnipeg.

Conditions in the various cities were discussed with much interest, and many new plans, for securing more business, were adopted.

On Wednesday evening, those present attended a banquet, at which the Rotary Quartette of Winnipeg furnished a splendid entertainment, followed by a theatre party.

W. J. Cormack, who passed away very suddenly at Toronto on June 7th, after an illness of about three weeks, was one of the oldest employees of the Great North Western Telegraph service. Mr. Cormack was born in Toronto in 1861, and spent his entire life in this city. Entering the employ of the Dominion Telegraph Company in 1874 as a messenger boy, his entire life from that time was devoted to telegraph business. He remained with the Dominion Telegraph Company as an operator from 1877 until 1881, when he entered the employ of the Great North Western Telegraph Company at the time of the amalgamation of the Dominion and Montreal Telegraph Companies, under the name of the Great North Western Telegraph Company.

Mr. Cormack never married, and for many years made his home with a brother and brother's family on Henderson Avenue in this city.

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Student's Course in Technical Telegraphy

No. 8

We are devoting considerable space to the question of main line and local battery connections, and it seems well worth while to do so. We cannot operate telegraph lines without battery, and before we take up such matters as line operation, instrument connections, adjustments, etc., if we get a clear idea how connections are made from generators to the lines by way of instruments or switchboards, we save a deal of difficulty later on.

It seems that in many elementary courses of instruction the mystery of battery connections is put off until the final chapters are reached; but the writer has found that it is of advantage to start with the source of current and from that point follow the current through its various connections and circuits until the whole subject has been covered. Indeed, as we have dealt with this subject during the past two lessons, it should be plain that there is no mystery about generator or battery connections, so the subject might as well be presented early as late.

One very important step that may be taken by the student is to copy the diagrams as presented in the Lessons. Pencil sketches will do, and these should be made as neatly as possible. A few years ago in New York a class along the lines herein being followed was conducted for telegraphers, and each student was required to make copies of the circuit diagrams. The class was composed of about fifty operators, and within six months after the course was completed more than three-fourths of the men were advanced to positions as repeater attendants, assistant chief operators, or to other positions in advanced grades.

It is the intention to present a set of questions to the students of this course after the tenth lesson has been published. This will consitute a written examination, and the names of those who obtain high marks will be published.

Strap and Disk Switchboards

At the smaller offices of the Postal Telegraph-Cable Company and of the Western Union Telegraph Company—as well as along railroad lines—there are in use at some points switchboards of the strap-and-disk pattern (Fig. 20). In recently equipped offices of both commercial telegraph companies and in railroad offices a new form of board is used which is made up of switch-block units containing pin-jacks.

The large main offices of the Postal Telegraph-Cable Company still employ switchboards of the strap-and-disk pattern for wire patching and for applying battery to main line single circuits.

At a small office, where one of these boards is in use, small plugs are used to connect line wires to instruments and to connect one wire to another wire in the board when so desired by the district wire chief.

At larger offices, where battery is applied to the ends of line wires, the same sort of plug is used to connect the battery to the wire. See Fig. 21.

In Fig. 21 is illustrated a bank of six generators, each one having a potential of sixty volts. One terminal of the machine on the left is connected to

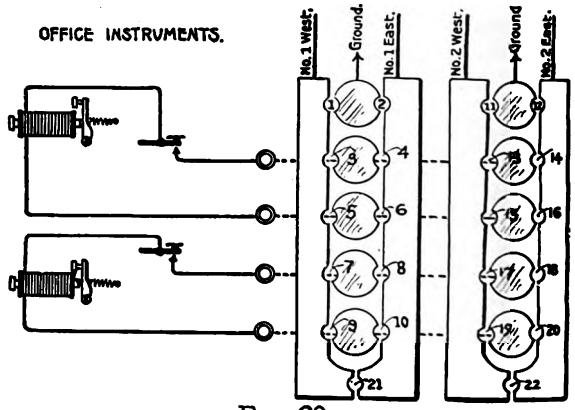

Fig. 20

earth while the other terminal of that machine is connected by wire to disks 1 and 2 of the switchboard, there being a resistance lamp inserted in series with the wire extending to each of these disks. The right hand brush of the second generator is connected by wire to disks 3 and 4, which places a potential of 120 volts on those two disks because the tap is made from a point at the end of two generators of sixty volts each in series, making 120 volts.

At the right hand brush of the third machine a tap is made where three generators are in series, yielding a total of 180 volts, and this tap is carried to disks 5 and 6 of the switchboard.

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If each of the four upright straps shown in the diagram has attached to its lower end a line wire it may be seen that a metal plug inserted so as to connect a given disk with that wire will connect the source of current with the wire. If, for instance, a plug is inserted in the hole on the right of disk No. 1 the line wire connected with the second strap from the left will have sixty volts applied to it, and if a plug is inserted in the hole on the left of disk No. 4, the line wire connected with the strap on the extreme left will have 120 volts applied to it. Although it is not so shown in the diagram, the battery wires connected to disks 1, 2, 3, 4, 5 and 6 are carried across the back of the switchboard and connected to the disks between each pair of upright straps. This makes it possible to connect the sixty, 120, 180-volt potential to any main line wire passing through the switchboard.

The scheme of employing a number of generators of equal voltage outputs, connecting them in series, and tapping from the end of the first, second, third or fourth machine to procure the desired voltage, is not used by the Postal Telegraph-Cable Company, and in Western Union service the new installations include individual generators of the required voltages. At a given terminal office four different voltages may be required for various purposes; say, 50, 100, 200 and 300 volts, and present practice is to use generators, each one of which has an output of 50, 100, 200, or 300 volts.

In the diagram, Fig. 21, although the wires leading from the generator brushes to the disks in the switchboard are shown as directly connected, it should here be stated that each of these wires actually passes through a fuse and a switch before it reaches the resistance lamp. These fuses and switches generally are mounted on what is known as a power switchboard. If the generators are situated on the same floor as the operating room the power board may be mounted close to the generators. If the generators are in the basement of the building, or on a floor remote from the operating room, it is customary to have the power board, or an auxiliary power board on the same floor as the main operating room so that chief operators may have ready access to the switches.

Generator Capacity

Before passing on to another subject it may be well here to say a few words about the capacity of generators; that is, as to the number of main line wires, or the number of sounders which may be fed from one generator.

The machines used in telegraph work are known as motor-generators, because they consist of a motor and a generator combined on one base. The motor is connected with the city lighting mains, through switches, so that when the current is turned on the motor operates and drives its companion generator.

Each end of these machines usually has mounted upon it a small metal plate with the machine's capacity and rating stamped thereon, and here, for the first time in these lessons, we have to tackle the word Kilowatt.

Years ago we referred to the electric lamps in our homes as having sixteen, or thirty-two candle power. Today we refer to these lamps as being of forty-watt, or sixty-watt capacity. We may avoid a deal of difficult explanation if we consider that a certain electric lamp is known to have a current of two amperes flowing through it when it is lighted up. If we know, also, that the voltage of the circuit in which the lamp is connected is 110 volts, then we may easily determine what the wattage of the lamp is; for by multiplying 110 by 2 we have the answer—220 watts.

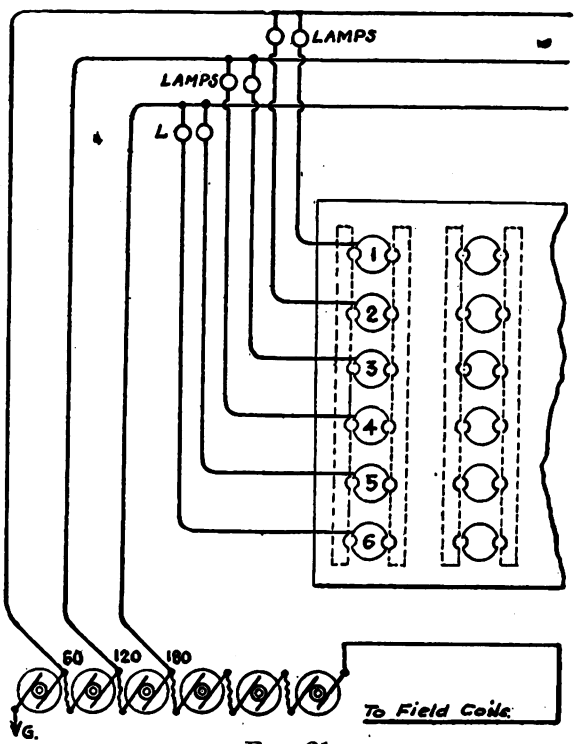

Fig. 21

Watts, therefore, mean the value arrived at by multiplying the voltage by the current flowing—the volts times the amperes. The word "kilo" signifies one thousand, so that a kilowatt is one thousand watts.

Now, if we observe the rating plate on one of the motor generators in a telegraph office we may find that it bears the following legend: "125 V ½ K.W." This means, simply, that, if the plate is on the generator end of the machine, the generator has a potential of 125 volts and the machine will supply current up to a capacity of one-half kilowatt; that is, 500 watts. If a chief operator is with us on this trip to the generator room he may say this particular machine is used to supply current to main line wires operated as single Morse circuits, and if our thinking equipment is working properly we shall remember that a wire from one brush of this machine is grounded and that the wire from the other brush is connected through a

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fuse, switch, and resistance lamp, finally reaching the disks in the main line switchboard.

If the engineering student is really inquisitive he may ask: "What has the 500 watts to do with it?" This is a good question, and quite timely. He may also want to know how many lines this machine will supply with current, and the answer to one of these questions will be the answer to the other.

In figuring out what the wattage of an electric lamp means we learned that the watts represent the value arrived at by multiplying the amperes by the volts. A little reasoning will suggest that if the wattage and the voltage are known the current flowing may be determined by dividing the watts by the voltage. The telegraph generator we are considering has a voltage of 125 and a wattage of 500; therefore 500 divided by 125 shows that the current amounts to 4 amperes.

If we ask the chief operator how much current is sent out on each wire fed by this machine he may state that each wire gets 50 milliamperes, which is one-twentieth of an ampere. The student may now scrutinize the metal plate on the generator; observe the reference to ½ K.W., and with a genuine show of knowledge state that the machine supplies current for the operation of 80 lines.

A generator producing 125 volts and ½ K.W. has a current output of 4 amperes, and if 80 lines are fed from it, each line getting one-twentieth of an ampere, then the machine is being worked up to its capacity.

The writer calls the student's attention to the fact that in this lesson plain, ordinary words are used, and that the figures employed are the ordinary fractions of arithmetic, and it is hoped that the lesson will be so thoroughly studied that in the examination to be held in the near future the young engineer will have but little difficulty in answering the questions presented.

(*To be continued*)

IN THE JULY 16 ISSUE OF TELEGRAPH AND TELEPHONE AGE WILL APPEAR AN ILLUSTRATED ARTICLE DESCRIBING GENERAL SQUIER'S NEW SYSTEM OF MULTIPLEX TELEGRAPHY AND TELEPHONY OVER OPEN-CIRCUIT BARE WIRES LAID IN THE EARTH OR SEA.

Fast Sending in the Early Days

As an item of interest, having a bearing upon the relative efficiency of quadruplex telegraph circuits when first introduced in the early "seventies" of the past century, and of quadruplex circuits of the present day, we present herewith a report of a speed test made on Western Union wires in September 1876, between New York and Boston:

FIRST TRIAL

STARTED 10:45 A. M., CLOSED 11:42 A. M.

No. 1 side, Kettles sending—61 messages containing 1936 words.

No. 1 side, Finch receiving—57 messages containing 1643 words.

No. 2 side, Stanford sending—69 messages containing 2264 words.

No. 2 side, Davin receiving—65 messages containing 2151 words.

A total for the hour of 252 messages and 7994 words—the performance on the second side of the quadruplex being higher than on the polar side.

SECOND TRIAL

STARTED 11:23 A. M., CLOSED 12:23 P. M.

No. 1 side, Stanford sending—69 messages containing 2055 words.

No. 1 side, Beardslee receiving—65 messages containing 2069 words.

No. 2 side, Davin sending—74 messages containing 2372 words.

No. 2 side, Kettles receiving—76 messages containing 2237 words.

A total of 284 messages and 8733 words; the men on the second side again keeping ahead of the men on the polar side.

The only one of these four operators now living is W. E. Kettles.

Although the tests were made mainly to determine the capacity of a single wire quadruplexed the performance of the operators is said to have been, on this occasion, only a little better than the average working of these men and of many other operators of those days. It should be remembered also, that in 1876 there were no semi-automatic transmitters, and typewriters had not then been introduced in telegraph work—each man used a ordinary Morse key in transmitting, and pen and ink in copying messages.

The operators named were at the Boston end of the circuit.

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THE RAILROAD
TELEGRAPH AND TELEPHONE

EFFECTIVE JUNE 10, H. C. James was appointed assistant superintendent of telegraph of the Northern Pacific Railroad at St. Paul, Minn., with jurisdiction over lines east of Paradise, Mont.

W. J. EAMES has been appointed general foreman of the Northern Pacific Railroad at St. Paul, Minn., succeeding H. C. James.

W. F. WILLIAMS, superintendent of telegraph of the Seaboard Air Line, was a New York business visitor on June 22nd. He was accompanied by Mrs. Williams.

EMPLOYEES of the general telegraph office of the Southern Pacific Railroad, Los Angeles, Calif., have been granted a ten per cent. increase in wages, and back time dating from October, 1918, at 11¾ per cent. for Sunday and holiday overtime.

STANLEY RHOADS, telegraph and telephone engineer of the New York Central Railroad, New York, has received the degree of Electrical Engineer from Perdue University. Mr. Rhoads is a graduate of Perdue, having received the Bachelor of Science degree at the time of graduation.

JOHN L. NIESSE, B.S., has received from Perdue University the degree of Electrical Engineer. Mr. Niesse is telegraph and telephone engineer in the service of the Big Four Railroad at Indianapolis, Ind.

A. C. CLOUDS has been appointed manager of the general telegraph office at Indianapolis, Ind., of the Big Four Railroad, vice W. H. Gipe, deceased. Mr. Clouds has been a member of the Indianapolis staff during the past twenty years, having started in the service as a messenger boy.

A. M. MINNICK, formerly of the advertising department, Western Electric Company, New York, has been appointed manager of the Cleveland, Ohio office of the Manufacturers' Publicity Bureau, Chicago.

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RAILROAD TELEGRAPH OFFICIALS are invited to send to the editor of TELEGRAPH AND TELEPHONE AGE news items announcing staff appointments and changes. We receive many requests for more railroad telegraph and telephone personal items. It is worth while for all telegraph departments to be represented in our columns periodically.

THE NATIONAL CITY COMPANY, in its New York office, has a telegraph staff of fifteen expert Morse telegraphers. Direct wires are operaed to various large financial centers throughout the coutnry.

AMERICAN RAILROAD ASSOCIATION

Telegraph and Telephone Division

Several important committee meetings were held at Atlantic City, N. J., beginning Friday, June 11. On June 11, meetings were held by the Committee of Direction, with Messrs. J. F. Caskey, chairman, and H. Hulatt, W. H. Hall and E. C Keenan present. Various important subjects were discussed, including plans for the annual meeting to be held in Winnipeg, Man., in September.

On the same day a meeting was held by Committee No. 6, Message Traffic, and Committee No. 1, Construction and Maintenance, Outside Plant. On June 14 the Committee of Direction held a meeting, and on June 15 Committee No. 7, Inductive Interference, met for the consideration of reports.

Committee members present included, in addition to those above mentioned, G. A. Cellar, E. A. Chenery, C. S. Rhoads, Stanley Rhoads, F. T .Wilbur, E. L. King, P. F. Frenzer, J. McMillan, I. C. Forshee, H. A. Shepard, L. S. Wells, and L. Behner.

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THE SPECIAL COMMITTEE ON DEVELOPMENT, Telegraph and Telephone Division, American Railroad Association, of which G. A. Cellar is chairman, held a meeting at Atlantic City, N. J., on June 11, at which various matters of interest to the communication departments of railroads were discussed.

J. D. JONES, superintendent of telegraph and signals, Pennsylvania Railroad System, Philadelphia, Pa., has been appointed a member of Committee No. 5, Telegraph and Telephone Division, American Railroad Association. The subject covered by this committee is "Telegraph and Telephone Development."

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

AT THE eighty-eighth commencement of New York University, held on June 9, Walter S. L. Cleverdon, son of John F. Cleverdon, chief electrical inspector, Postal Telegraph-Cable Company, received the degree of Mechanical Engineer. Several years ago he graduated from the University as a Civil Engineer.

LIEUT. J. MALONE, of the Australian Overseas Forces, who remained in the United States several weeks on his return trip from France to Australia, has been appointed Deputy State Engineer, Post-office Telegraphs, at Perth, West Australia.

W. L. IVES, for many years in the telegraph service in New York, and widely known Old-Timer, is now living in Syracuse, N. Y. During the past few weeks he has been laid up on account of illness.

JOHN H. BELL, telegraph engineer, Western Electric Company, New York, has gone to London, England, on a business trip.

A. J. EAVES, telegraph engineer, Western Electric Company, New York, is now in California on a business mission

A. A. PATTERSON, formerly manager for the Western Union Telegraph Company at Bay City, Mich., is now general manager on the Pacific Coast for the Aladdin Company, with offices at Portland, Ore.

MISS EFFIE J. O'NEAL, of Washington, D. C., daughter of William C. O'Neal, a veteran of the United States Military Telegraph Corps, who died eight years ago, was married in that city to Mr. Randolph Whitt on June 12th. Miss O'Neal was, in 1915, elected an auxiliary member of the Society of the United States Military Telegraph Corps in recognition of valuable services rendered by her in Washington in support of the long-pending pension measure which was finally reported favorably by the House Military Affairs Committee on April 13th last.

IN THE SEATTLE, WASH., OFFICE of the Postal Telegraph-Cable Company there is an "Old-Timer" who turns out excellent poetry. Some day when a collection of telegraph poetry is published his contributions should be included.

POSTAL TELEGRAPH-CABLE COMPANY

C. A. COMSTOCK, assistant to the general manager, has returned to his office after visiting Indianapolis, Detroit, and Cleveland.

E. P. TULLY, assistant to the general manager, on his return from the Chicago Convention stopped at Buffalo, Rochester, Syracuse, and Albany, making an inspection of local service at each point.

F. P. PHILLIPS, plant supervisor, Chicago, Ill., was a recent executive office visitor.

AT MACON, GA., arrangements have been completed for moving the local office into larger and better quarters in order to properly take care of the growing service at that place.

J. P. O'DONOHUE, assistant chief engineer, has returned from a visit to Cleveland in connection with the work of fitting up the new office at that place.

W. C. DAVIET, assistant to the general manager, has returned from a visit to offices at Minneapolis, St. Paul, Duluth, and Superior.

Main Operating Room New York

WALTER REDLAFSON, quad chief, is on his annual vacation. Mr. Redlafson was married recently to Miss May Feehan, Morse operator in this office.

C. W. ORAM, quad chief, is on his annual vacation, visiting Chicago and other western cities.

C. B. OBST, FRANK HENNIG and GEORGE T. MITCHELL have returned from their summer vacations.

New York City Notes

CITY MANAGER D. SHORTELL was paid a visit recently by Henry Stewart, long distance walker, of San Diego, Calif. Mr. Stewart arrived in New York on June 10, having walked across the United States in 108 days.

M. A. KOFFLER, cashier of the Jacksonville, Fla., office, was a recent visitor in New York.

WILLIAM ANDERSON, heretofore employed in the 42d Street branch office, has been transferred to the new office at 145 Washington Street.

Boston, Mass., Postal

CHARLES T. O'DAY has been appointed manager at the 778 Beacon Street branch office.

M. CLAIR, heretofore manager at Roxbury branch, has been appointed manager of the Tremont branch.

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GEORGE W. DOWNEY, manager of the fish pier branch, and J. J. McCarthy, manager of the Market branch, are on their annual vacations.

J. D. MCDONALD, manager, is spending his annual vacation at the seashore.

MISS H. F. MCCOBB has been appointed manager of the summer office at Watch Hill.

BARNEY CURWITZ is the expert now paired with Mr. Fitman on the second New York-Boston bonus circuit.

FRED F. GOSS, recently of New York, is working on the first New York bonus wire.

C. W. LANFAIR, night chief operator, is on his summer vacation, motoring through the Berkshires.

MR. LETOURNEAU, of the operating staff, went to Chicago to attend the Republican Convention as a Johnson delegate.

O. A. CARLSON, of the second New York bonus circuit, has gone to Denver, Colo., where he will continue in the telegraph business.

THE BOSTON POSTAL BASEBALL TEAM, composed of main office operators, has so far this season won every game played. Their latest victims were a team made up of Newton High School players. We have been very fortunate in having with us such fast men as "Jack" Riner, shortstopper. Jack has played semi-pro ball and is some slugger. "Cliff" Rummell, formerly of Newton High, is doing the honors at twirling, and the opposing batters find him a hard boy to hit. "Red" Brennan is just as good behind the bat as he is a bonus man on first New York wire. A series of games is now scheduled between the Postal and Western Union. The Postal team is managed by Quad Chief Langlois.

Postal Western Division

JAMES E. PARKE, manager at Keokuk, Iowa, has been laid up during the past month on account of a fractured wrist.

A. L. BURNS has been appointed manager at Clinton, Iowa, vice I. J. Roedel, transferred to Lexington, Ky. Mr. Burns was formerly manager at Eaton, Ohio.

CLARA MILLER has been appointed manager at Marinette, Wis. For some time past Miss Miller has acted as manager at Elgin, Ill.

MARY DAVIS has been appointed manager at Beloit, Wis., and Miss Shelhorn, manager at Council Bluffs, Ia.

MRS. E. C. HOLLAND of the Indiana Harbor office has been promoted to the managership at Waukegan, Ill., vice J. Krasnicky, transferred to Davenport, Ia.

NETTIE MIXON, formerly at Hannibal, Mo., has been appointed manager at Indiana Harbor, Ind., and Clara Leeper, temporary manager at Alton, Ill.

THE GRAND RAPIDS, MICH., OFFICE has been redecorated and equipped with a new and up-to-date outfit of furniture. The equipment of the office is now modern in all respects.

WESTERN UNION TELEGRAPH COMPANY

NEWCOMB CARLTON, president, attended the Republican National Convention in Chicago, and returned to New York on June 14.

T. W. CARROLL, general manager, Eastern Division, visited offices in the Maritime Provinces during the week of June 12.

A. WOODLE, city superintendent at Buffalo, N. Y., is reported recuperating from a recent illness.

E. R. COLLINS, city superintendent at Pittsburg, Penn., returned from his annual vacation, which he spent on the Pacific Coast.

F. E. D'HUMY, central office engineer, has been granted patents covering important inventions in methods of garage and warehouse construction. The Ramp Buildings Corporation of New York has purchased the right to make use of these inventions in prospective building construction in various parts of the country.

C. B. LONGSWORTH, chief clerk to G. M. Yorke, vice-president in charge of plant and engineering, is one of the busiest men in the executive offices. His desk is generally in good shape because he keeps things moving rapidly. Mr. Longsworth succeeded T. L. Hunt as chief clerk about six months ago.

SOARING RENTS in New York City continue to drive telegraph people to the suburbs. The latest Western Union man to purchase a place in the outer regions of the city is Robert Ellis of the plant department.

C. H. SIMPSON, formerly manager at Franklin, Pa., has been appointed manager at Bridgeport, Conn., vice D. H. Russell, transferred to the Pacific Division.

F. L. COLOHAN has been appointed manager at Elizabeth, N. J., vice R. A. Liddane, furloughed.

SUMMER OFFICES have been opened at Spring Lake, N. J.; Ridgefield, Conn., and Painter, Va.

DANIEL SKELTON, formerly superintendent of the American District Telegraph Company, and more recently attached to General Superintendent Nathan's staff, New York, died at Ocean Grove, N. J., on June 16. Interment was at Maspeth, L. I.

New York Western Union

THERE ARE upwards of 200,000 business firms carrying on commercial operations in New York City.

TWENTY-ONE Department Heads attended a dinner and business meeting at the Clarendon Hotel on Monday, May 24th.

JAMES J. MCCAFFREY, night manager of the office at No. 313 Fulton Street, Prooklyn, has been appointed manager of the race track offices in New York State, which include Belmont Park, Jamaica, Saratoga, Piping Rock, Aqueduct and Empire City. He will be assisted by H. Beckman, John Dunn, John Breslin and John McKillen. This is Mr. McCaffrey's eighth year in charge of the Race Bureau.

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Two Hundred officials and employees of the first and second districts of the Metropolitan Division attended a dinner and dance given at the Hotel McAlpin on May 11.

It is said that in New York City four new firms start in business every forty-two minutes.

W. E. Peirce, of the Washington, D. C., operating staff, has joined the testing and regulating force at No. 24 Walker Street, New York.

E. W. H. Cogley, manager for the Western Union Telegraph Company at Lewiston, Pa., was a New York visitor last week. Mr. Cogley was for many years a prominent figure in telegraph circles in New York and other large centers, and for several years was superintendent of telegraph of the Associated Press. He made his New York visit the occasion to call on many of his old friends.

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Western Union, Lake Division

Miss Frances S. Doan, head of the Employment Department at Chicago, has resigned from the service to return to her home in Indianapolis, Ind. Miss Doan is a graduate of Swarthmore College, and is one of the group of young college women who came into the company's service during the war emergency. Her management of the Employment Department has been of a highly satisfactory nature, and she leaves the department in excellent condition. Miss Doan is succeeded by Miss Margaret McCann, a Western Union employee of several years' training and experience.

F. T. Moran, who has appointed chief clerk to Superintendent Brown at Chicago, is one of the younger men in Western Union service, whose enthusiasm, energy and determination to do good work has been reflected by his steady advancement from one position to another since he started as messenger boy in Chicago twelve years ago. Mr. Moran has filled successively the positions of messenger boy, assistant delivery clerk, delivery clerk, claim clerk, cable clerk, and district cable manager. From May, 1918, until January, 1919, Mr. Moran was in overseas service, and since his return has been active in organizing the Western Union Post of the American Legion among the service men in Western Union employ.

E. C. Ziesel, heretofore chief clerk to Superintendent Brown, Chicago, has been transferred to special duties in General Manager A. C. Cronkhite's office.

C. E. Jones, manager at Dayton, Ohio, and T. E. Jones, manager at Springfield, Ohio, were called to Zanesville, Ohio, recently on account of the death of their mother.

Miss Iona Arzeno, manager at Sardinia, Ohio, has returned to duty after an absence due to illness.

E. J. Gutshall has been appointed manager at Shelby, Ohio, vice H. W. Wise, furloughed.

G. A. Rice has been appointed manager at Circleville, Ohio, vice J. E. Thomas, furloughed.

Gulf Division, Western Union

Effective June 1, the following offices in charge of their respective city superintendents, were placed directly under the jurisdiction of the general manager of the Gulf Division, and will be operated as divisional offices: Dallas, Tex., L. A. Ott; El Paso, Tex., T. A. Darling; Fort Worth, Tex., A. C. Farmer; Houston, Tex., J. D. McClelland; New Orleans, La., W. A. Porteous, Oklahoma City, Okla., O. J. Pickle; Tulsa, Okla., H. B. Gale, and San Antonio, Tex., F. H. Morris. City superintendents are directly in charge of the supervision and handling of local offices.

Effective June 1, all offices in Louisiana will comprise the first district, Gulf Division. Managers of these offices will report to J. F. Wilson, district commercial superintendent, Dallas, Texas.

Effective June 1, all offices in Arkansas and Oklahoma will comprise the third district, Gulf Division, reporting to F. H. Austin, district commercial superintendent, Oklahoma City, Okla.

Oklahoma City, Okla., Western Union

Ralph R. Tullis has been appointed claim clerk in the office of the district commercial superintendent.

H. S. Covey, heretofore late night wire chief, has been advanced to the position of night wire chief.

Bert Whitehead, formerly in the service of the Southwestern Bell Telephone Company, has been appointed late night wire chief.

The Plant Department has in hand the construction of ten new main line circuits out of Oklahoma City.

A Number of additional branch offices are to be opened in Oklahoma City in the near future.

The Traffic load in Oklahoma City office for May, 1920, shows a gain of 32 per cent. over the same month of 1919.

Employees of this office have begun the regular publication of a house organ. C. A. Wallace is managing editor, and the department correspondents are S. H. Burton, multiplex; Charles Blevins, testing and regulating; Charles Clark, Morse; Mrs. M. L. Ormesher, telephone; Ada Hunley, women's department, and illustrator; Mrs. M. Culley and Joseph Daniels, cartoonists. The name of the paper is the *Oklahoma Sooner*, and the first number—for May—is a very creditable production.

Washington, D. C., Western Union

D. F. Brown, of this office, is visiting friends in New York and Boston.

Marion Keister has returned from a furlough and is in charge of automatics at night.

J. H. Call, equipment chief in this office, has completed a course in a Chiropractic college and was graduated as a Doctor.

Percy Wimsatt, employed as expert telegrapher in the service of a brokerage firm, recently suffered a stroke of paralysis, but is reported recuperating satisfactorily.

Rose Callan, who has been spending her vacation in Philadelphia, has returned to duty.

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WESTERN UNION DINNER AT CHICAGO

Lake Division Officials Have Dinner at Auditorium Hotel

Learning of the important dinner to be given by the officials of the Lake Division, Chicago, as a climax to an intensive business-getting campaign conducted during the month of May, TELEGRAPH AND TELEPHONE AGE requested one of its news gatherers in Chicago to attend the affair and make a report. The following is the story:

"The dinner given by the Commercial Department of the Lake Division at the Auditorium Hotel, Chicago, May 21, was one of those very enjoyable affairs peculiar only to the communion of those of kindred purpose, thought and spirit. It was a sort of wind-up of an inspection by General Commercial Agent Kauffman of the progress made in the campaign to broaden the scope and extend the use of the telegraph for business purposes—to substitute for the slow-going mails, and it was also the occasion for presenting prizes awarded for the best forms of letters to patrons following up and reminding them in a fitting way of the writer's call upon them in this campaign work; and it took on some phases of the political ratification or jollification meetings where everybody rejoices over what has been accomplished.

"It was not a departmental gathering; there was something in the telegraph atmosphere which made us feel that there was too big a time in sight to restrict it to one department. This brought to the festal board General Commercial Agent A. C. Kauffman of New York, General Manager Cronkhite, Division Commercial Agent Eldridge and other members of the general manager's staff; Division Traffic Superintendent Welch and Division Auditor Sprague and members of their staffs.

"Unfortunately, Division Plant Superintendent Wyrick was unable to attend, but was represented by members of his staff; District Superintendents Brown and McGrath of Chicago, Boenig of Detroit, Montgomery of Cincinnati, City Superintendents Burr of Detroit, Ross of Cleveland, Scholl of Cincinnati, Brown of Indianapolis, Travis of Milwaukee, Cadwallader of Toledo, Grob of Columbus, and the prize winners:

E. W. Malloy, district commercial agent, Detroit, first prize; C. H. Lacey, manager, Sandusky, O., second prize; R. P. Wines, Battle Creek, Mich., third prize.

"General Manager Cronkhite presided in his usual gracious, suave way, always interesting and pleasant, but a little more so at this time. Commercial General Agent Kauffman made the principal address and for the benefit of those from other departments, he described the plan of the development campaign, expressed satisfaction with the manner in which the work is being carried on and complimented the field workers upon their achievements thus far. Then Mr. Eldridge came to bat and managed to sandwich in between his jokes and witticisms enough straight language to tell us about how the field force do the work of the campaign; their intense interest and enthusiasm, whtich means SUCCESS all in 'caps.'

"The friendly rivalry between District Superintendents Brown, Boening, McGrath and Montgomery to have us understand that their respective districts are entitled to the first place in the sun was quite amusing. The city superintendents would not stand for what appeared to them to be the desire of the district people to be the 'whole cheese,' so they came to the firing line with their narratives of achievement and flights of oratory which made some of us wonder just where we were. Division Traffic Superintendent Welch pinned responsibility for success of the campaign on the Commercial Department with the promise that the Traffic Department in its share of the work would see that what the Commercial Department sold should stay sold and that they would take the business from the commercial people at the starting point and deliver it to them at destination points in good time and order. Division Auditor Sprague pledged the support of his department; all of us know the Plant Department can be counted on.

"General Manager Cronkhite presented the handsomely engraved certificates of award to the successful prize winners, Messrs. Malloy, Lacey and Wines.

"The music was excellent; a couple of original ditties composed for the occasion by George C. Mason, the Commercial Department Poet Laureate, were rendered; the singing was conducted by Bruce Allen, who is a past master in things of that kind."

Questions and Answers

F. J. PHILLIPS: The Questions and Answers Department was discontinued several months ago due to lack of space for published answers. All questions now received are being answered by mail when the address of the sender is given.

Replying to your inquiry:

You may get along without rewinding the movement coil. I have changed meters over by taking two or three rheostats and connecting them in series with the movement coil adjust the resistance until the needle registered the same as a voltmeter would do on the same applied emf. It takes about 2000 ohms per volt. After you have by means of the rheostats determined how much series resistance is required to make it register volts correctly you can have that amount of resistance made up small enough to put in the meter case, or in an external box of small size.—EDITOR.

CHARLES HITCH, for the past four years draughtsman in the engineering department of the Postal Telegraph-Cable Company, New York, has joined the draughting force in the engineering department at 195 Broadway.

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The Western Union Telegraph Company is conducting a large cable-multiplex school at its Miami, Fla., office, training a staff of operators for the Miami—"CO" New York multiplex circuit. This circuit will handle cable traffic between the New York cable office and Miami; Miami being the northern terminal of the Miami-Barbados-Para cable, which is to be completed early this summer.

The accompanying photograph, taken in the grounds of the famous Royal Palm Hotel at Miami, shows some of the Western Union officials, the instructional staff and students of the school. This school consists of fifty-five students, taught by seven instructors, and occupies a suite of seven rooms in a building near the Miami main office. Equipment consisting of complete equipment for both land line and cable stations has been furnished for teaching cable and land line operation.

While the Miami-New York circuit will be a regular three-channel multiplex land line circuit, operation at Miami is made unusual by the fact that traffic received from the cable and relayed to New York will be perforated direct from the gummed siphon recorder slip. The school was started January 5 of this year, and after only four months of practice many of the more advanced students are able to perforate accurately from 35 to 50 messages per hour from recorder slip. This is very good work, in view of the fact that the students knew absolutely nothing of the telegraph or cable business until they enrolled in this school.

FRONT ROW: H. J. Gilbert, wire chief; R. J. Wise, automatic attendant; H. S. Wright, chief operator; C. M. Brentlinger, general inspector, New York, in charge of School; H. A. Smith, division traffic engineer, Atlanta, Ga.; S. L. Burts, division traffic superintendent, Atlanta, Ga.; J. C. Bailey, assistant superintendent, Bay Roberts, N. F., cable station, in charge of cable instruction; Irma A. Ekblom, New York, cable instructor; Exie Waters, student-instructor; Avis H. Browning, Richmond, Va., land line instructor; Ruth Brundage, James Cann., Thelma Hendrix, Helen Harrod, student-instructors.

SECOND ROW: Harold Cox, Vernice Hearn, Margaret Walker, Lois Huddleston, Juliet MacVicar, Vera Perpall, Katherine Thompson, May Osborn, Rosalie Albury, Ruth Harper, Clara Harper, Agnes Ryan, Lane Robertson, Edna Taylor, Jeannette Morrison, Margie Stebbins, Isabel Camalier, Beatrice Dowling, Bernice Kruse, Ruth Tibbits, students.

THIRD ROW: Neil Lyon, Ella Cahoon, Annie Fay Albritton, Harold Albury, Anita Songer, Ralph Partridge, Loraine Goodspeed, Etta Sanchez, John Roberts, Cecil Taylor, Margaret Kain, Leda Mae Ray, Rhea Martin, Mabel Duval, Elizabeth Bradford, Effie Mae Hinson, Raymond Corbitt, Herbert Roland, Laura Pierce, Arlene Carey, Eva Glenn, Leo Thain, Minnie Holston, Ethelyn Harris, Jessie Chesser, Nannie Barrington, Edythe Mann, Bertha Fox, Leila Sands, students; Carolyn McKisack, nurse; Mildred Potter, student.

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Telegraph and Telephone Age

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Salaries

From the beginning of history until recent times men who were ambitious to have employment where they might plan and direct the work of others found it necessary to prepare themselves for such work by years of study; at considerable expense, and in many instances with no little self-denial during the training period.

The objects were to gain advanced position; to qualify for association with other men of learning and of high ideals; and to earn salary above that paid those who would not go to the trouble to qualify for responsible positions.

Certain industrial developments since the war terminated have altered somewhere the ratio of the gears—so, that unless corrective developments set in a time may arrive when learning and managerial ability, if cultivated, will yield a return no greater than that taken by the multitude who do the day's work with an eye to five o'clock. The manager of a telegraph office in a good-sized town may receive, say, $6.00 per day income, and if he has the cottage papered he will pay the paperhanger $10.00 per day to do the job. That, or get along with the old paper.

Certain present tendencies, if continued, will mean that the shortest and surest route to a garage and a dress-suit will be to shun the printed page and learn the finesse of the trowel or the cold chisel.

But, it seems illogical that these tendencies should continue. In time, sensible ratios will be restored.

The foregoing ruminations are prompted by a consideration of the case of railroad telegraph superintendents. The salaries of these officials are practically the same as they were five years ago, and the ability necessary to hold the position of head of the communications department is being rapidly stepped up as a result of technical developments and improvements. It is no longer economical to draft a superannuated chief train dispatcher for the place of superintendent of telegraph and telephone. The telegraph superintendent who is not a born, or a trained engineer, cannot hope to maintain a wire system which will compare favorably with that of railroads having such talent.

The railroad telegraph superintendents have a powerful organization—nation wide. The organization now constitutes a section of the American Railroad Association, and it is a monumental ethical tribute to these men that they have at all times confined their deliberations and discussions to technical subjects having to do with the improvement in and more economical operation of communication lines.

There are railroads in this country which pay their superintendents of telegraph no more than many telegraphers are receiving. Certain large brokerage firms have, by increasing their business, and by advancing their commission charges, been enabled to advance telegraphers' salaries to $65.00 per week. That is $3,380.00 per year. Premium-circuit telegraphers in large commercial telegraph offices are earning $3,360.00 per year, and no one thinks these expert operators are getting a cent too much, under present living conditions, for the work they do.

Whatever may be in view in the way of readjustment of salaries it is nothing more than simple justice that telegraph superintendents' salaries should be advanced in the immediate future to a figure which will restore the ratio obtaining five years ago. That ratio would not be reached if the minimum salary for a railroad telegraph superintendent were made $6,000 per year, with an average for the country of, say, $7,000 per year. These minimum and average figures would permit of higher salaries being paid general superintendents of telegraph of the large trunk railroads—salaries which would compare favorably with the incomes of other department heads.

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Multiplex Telephony and Telegraphy Over Open-Circuit Bare Wires Laid in the Earth or Sea.

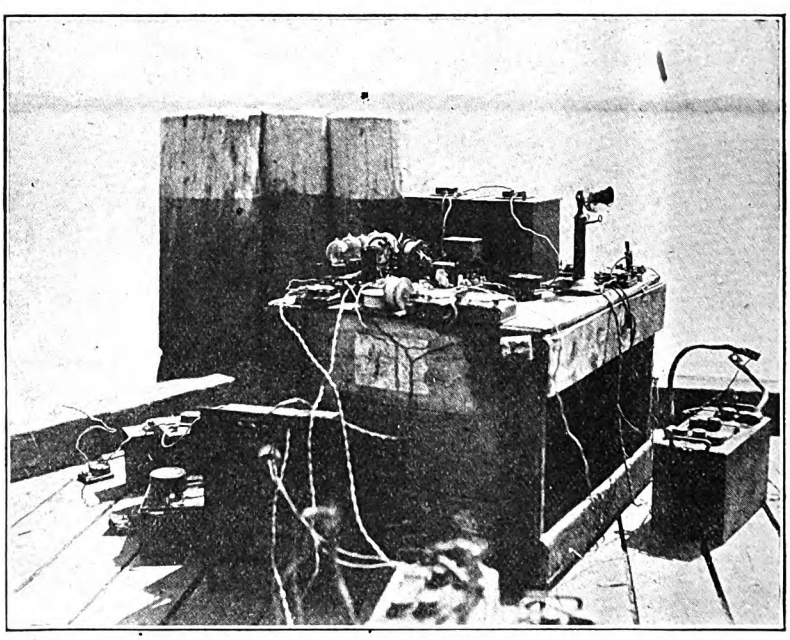
By Major General George O. Squier,
Chief Signal Officer, United States Army.

The "key problem" in the procurement of essential Signal Corps supplies in the United States during the World War, curiously enough, turned out to be the production of the necessary braiding machines for finishing insulated wire. The bare wire itself could be obtained, the rubber insulation could be obtained, even the cotton thread with which the braiding was made could be obtained, but the necessary machinery for braiding the thread, which finally led us into the difficulties of the procurement of steel, was never anything like adequate for the enormous demands required in the field.

The braiding capacity of the entire United States, as of September 1, 1918, was sufficient for about 8,000 miles of twisted pair insulated wire a month, while the requirements for the American forces alone at that date were about 40,000 miles a month. On October 1, 1918, the Allied Council reached the decision that beginning March 1, 1919, it would be necessary for the United States to furnish all of this type of wire used by the Allied armies in the field, and the estimated minimum requirements for this purpose were 100,000 miles a month. To supply this amount of insulated wire would have required cargo space for overseas shipment in the amount of 14,000 ship tons a month, but had it been possible to use single conductor bare wire in place of the twisted pair insulated wire, the space would have been reduced to 2,500 ship tons a month, thus releasing the balance for transportation of food, and other vitally necessary supplies.

It is, therefore, of paramount importance to diagnose, as far as possible, the technical problems of equipment in the light of past experience and of the present trend of development.

The above facts show the necessity of developing, if possible, new methods by which a reduction may be effected in the enormous quantities of expensive and bulky insulated wire, which was so difficult to procure during the World War.



Photograph A

The following reasoning led to the carrying out of the experiments to be described.

1. Since we can already communicate by radio means between one submarine and another submarine, both completely submerged, it was considered that connecting two such stations by a submerged copper wire could have no other effect than to facilitate the propagation of the electromagnetic waves between the stations.
2. It was considered possible that earth or

**From the Journal of the Franklin Institute, June, 1920.*

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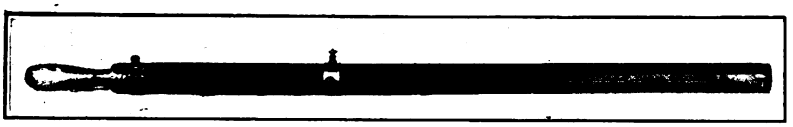
water under the action of high frequency electromagnetic forces might exhibit greatly different properties from those with which we are familiar at direct or low frequency currents.

3. It was believed that whatever high frequency energy losses might occur in the transmission over bare wires laid in earth or water, the over-all efficiency would be higher than in the case of radio space transmission where the plant efficiency is so very low.

4. It was noted by the writer in September, 1910, and discussed by him in April, 1912†, that the three electrode audion could be used as a potentially operated device on open circuits. This arrangement was considered suitable for the reception of the signals over bare wires in earth or water.

One of the questions to be investigated was the general effectiveness of the electron tube when used as a potentially operated instrument connected to an open line.

The following experiment was made in the office of the Chief Signal Officer, Washington, D. C.: A strip of wire netting was buried in the snow outside, with a wire attached to it leading to the second story of the office. The upper end of this wire was connected directly to the grid of an electron tube. The reason for connecting the grid to the upper end of the antennae is, of course, obvious. For maximum sensitiveness it is necessary to connect it to the point of maximum potential of the antennae, which in the case of a linear oscillator occurs at the open end. By this arrangement, messages were readily received from distant points in the United States.



PHOTOGRAPH B

PRELIMINARY EXPERIMENTS

The first experiment was an extremely simple one, as follows: A bare No. 18 phosphor bronze wire, such as is used for Signal Corps field antennae, was laid across the Washington channel of the Potomac River from the War College to the opposite shore in Potomac Park. It was paid out from a small boat with sufficient slack to lay on the bottom of the river. Care was taken to make this preliminary experiment as simple as possible, and precaution was taken to insure that the wire itself should be bright and clean and entirely free from any grease or other insulating material. A standard Signal Corps radio telephone and telegraph set, SCR 67, was directly connected to each end of the wire, one set serving as a transmitter and the other as a receiver. At the receiving end of the line the bare wire was directly connected to the grid terminal of an electron tube in the receiving set and the usual ground connection left open. A frequency of about 600,000 cycles a second was used and the line tuned at each end by the usual methods. Excellent telegraphy and telephony were obtained.

This experiment demonstrated the possibility of transmitting electromagnetic waves along bare wires submerged in water, and the use of an electron tube as a potentially operated device on open wire for the reception of signals.

The success of this simple experiment led immediately to a more thorough consideration of the entire subject.

THE PROPAGATION OF ELECTROMAGNETIC WAVES OVER BARE WIRES IMMERSED IN WATER

A series of tests was arranged to check more carefully the results of the preliminary experiments and also to get more complete information on the possibilities of the method of using bare wires submerged in water for high frequency current telegraph and telephone communication. The tests were conducted between Fort Hunt, Virginia, and Fort Washington, Maryland, located on opposite banks of the Potomac River, approximately twenty-five miles south of Washington. The wire consisted of a bare seven-strand No. 18 phosphor-bronze antennae were submerged for approximately 3,000 feet (914 m.). The two terminals were brought out on the wharves where the transmitting and receiving apparatus were located, as near as possible to the surface of the water as shown in the accompanying photograph "A." The length of the exposed portion of the wire at the transmitting end was about 7 feet (2.1 m.), while at the receiving end it varied from 5 to 25 feet (1.5 m. to 7.6 m.), depending upon the location of the receiving apparatus in the various experiments.

TRANSMITTING DATA

The transmitter was located on the Fort Hunt wharf on the Virginia side of the Potomac. It was of the electron tube type oscillator with Signal Corps VT-2 tubes. The particular type of circuit employed was developed especially for wired wireless transmission and possesses features which make it directly applicable to this type of work. Buzzer or voice modulation was

†*Journal of The Franklin Institute, April,* 1912, *"Some Experiments in 'Wired Wireless' Telegraphy for Field Lines of Information for Military Purposes," by Major George O. Squier, Signal Corps, U. S. Army.*

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also provided for, the modulating circuit being identical with that employed in the standard Signal Corps radio telephone apparatus. The source of modulated high frequency energy was coupled to the submerged wire as shown in Fig. 1, where the source is shown at the left, T is a radio frequency transformer, L a variable inductance, C is a variable condenser. A transmitting wave-length of 1,050 metres was adopted, as this

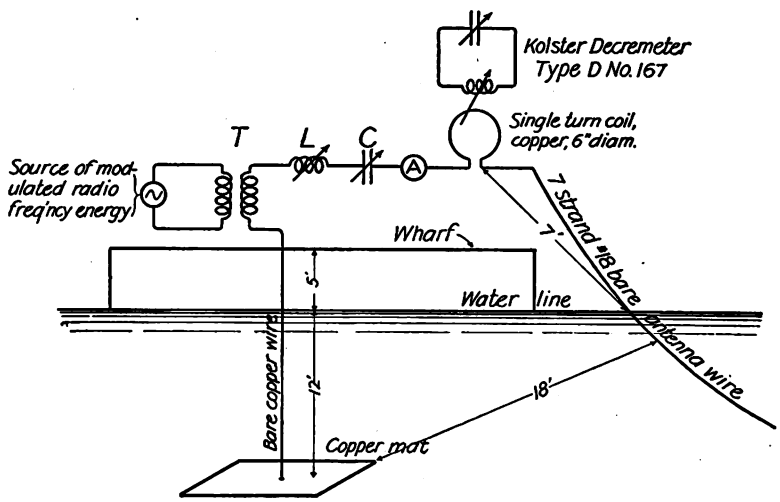

FIG. 1

was very closely the wave-length for which the amplifier at the receiver was designed. The tuning of the submerged wire by means of the variable inductance and capacity was remarkably sharp, a definite maximum value of current being obtained, which at resonance averaged 250 milliamperes. In general, the line behaved as a lumped inductance rather than a capacity; a variable condenser in series is necessary to tune this line. At this frequency the line was found to have an equivalent inductance of about .02 of a millihenry.

RECEIVING DATA

The receiving apparatus was located at Fort Washington, Maryland, on the east bank of the Potomac River.

Test No. 1.

A Navy type SE-1420 radio receiver, and a Signal Corps SCR-72 audio frequency amplifier were employed. The schematic arrangement is shown in Fig. 2. The circuits of this receiver are inductively coupled, the secondary having a wave-length range of 200 to 8,000 metres, and may be made oscillatory or not at will. With the connections indicated in the figure, and with the ground connections either on or off, *no signals were received* in an oscillating circuit receiver when the distant transmitter was unmodulated or in a non-oscillating receiver when the transmitter was modulated by a buzzer or the voice. Both spark and continuous wave signals, however, were received from nearby radio stations when the ground connection was removed.

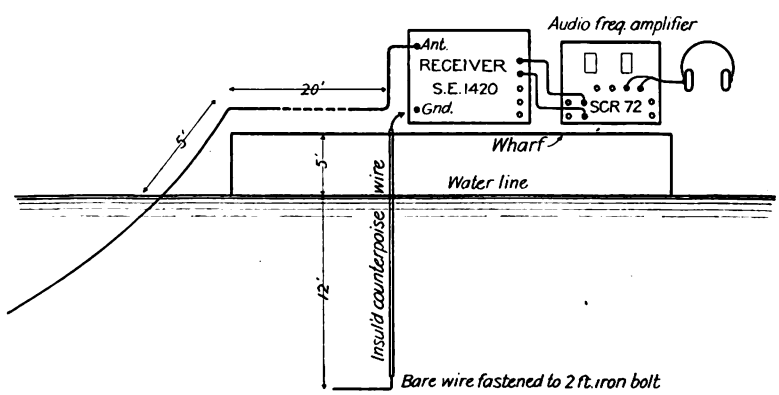

FIG. 2

Test No. 2.

A simplified circuit was next used connected

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as shown in Fig. 3, consisting of a simple oscillatory circuit, the bare wire being connected to one terminal of the condenser and to the grid.

A Signal Corps type BC-8 amplifier, consisting of three stages radio frequency amplification, one detector tube, and two stages audio frequency amplification was used. The radio circuits of the amplifier were at resonance at 1,050 metres. With this arrangement both buzzer modulated signals and speech were received from the transmitting set at the other end of the submerged wire. The tuning at the receiving end was sharp. Signals from radio stations were also received. Connecting the ground mat to the input filament terminal of the amplifier completely eliminated all signals. With the submerged wire connected direct to the grid and the oscillating circuit removed, no signals were received.

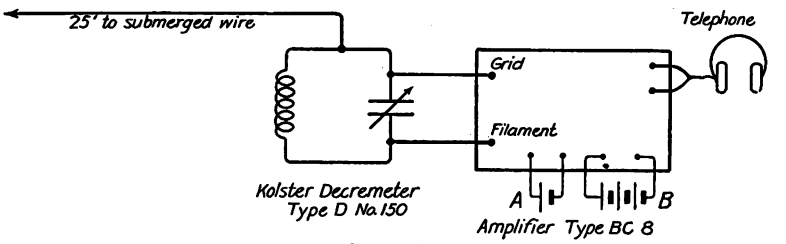

FIG. 3

In both of the above tests the receiving apparatus was located approximately five feet (1.5 m.) above the water level, and twenty feet (6.1 m.) horizontally from the actual terminal of the submerged wire. To determine to what extent the exposed twenty feet of horizontal wire was acting as an "antennae," the entire receiving apparatus was moved close to the terminal of the submerged wire, the exposed portion thus being reduced in length to approximately five feet (1.5 m.). Under this condition, the intensity of the received signals *was considerably reduced.* Replacing the exposed twenty feet (6.1 m.) of wire, and moving the apparatus back to its original position did not, however, bring back the signal to its original strength. Later investigation of this point showed that at this time, trouble developed in the modulating circuit at the transmitter, which accounted for the weakening of the signals, and therefore was not due to the shortening of the exposed wire. Disconnecting the submerged wire, with or without the twenty feet (6.1 m.) of exposed wire attached to the circuit totally eliminated all signals. This demonstrated that with the apparatus and circuits employed, the signals received were transmitted over the submerged bare wire connecting the two stations, and, that the "antennae effect" of the short length of exposed wire at the receiver was entirely negligible.

Test No. 3.

An experiment was tried in which the submerged wire was connected direct to the grid input terminal of the amplifier. It was found, however, that the latter "howled" so badly as to prevent the distinguishing of any signals. Shunting the input terminals of the amplifier with a capacity of about 200 mmfd. eliminated the howling and brought in signals from the transmitter.

Test No. 4.

The submerged wire was led directly to one terminal of a single layer coil. The diameter of this coil was 1½ inches (3.8 cms.), wound with No. 36 double silk-covered wire, length approximately 28¼ inches (71.75 cms.), total number of turns, 4,100. The other terminal was left free. A brass ring about one-half inch (1.27 cms.) wide, split longitudinally and provided with a binding post and small rubber knob, could be slid over the coil for the purpose of locating points of loop potential on the coil. This ring or band was completely insulated from

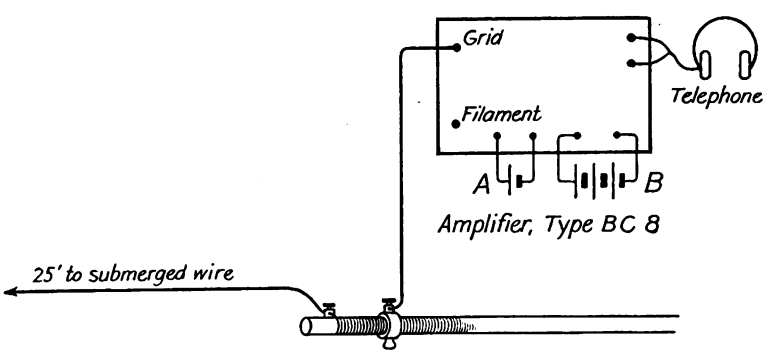

FIG. 4

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the coil winding. A short flexible lead connected this band to the input grid terminal of the amplifier used in the preceding experiments. The circuit is shown diagrammatically in Fig. 4. Standing waves were found to exist on the coil,

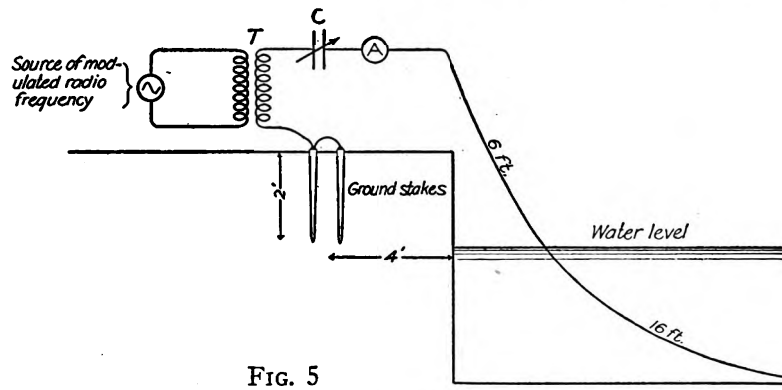

FIG. 5

and the buzzer signals were received. Two potential loop points were noted on the coil; the one giving the louder signals being that nearer the free end of the coil. The coil was turned in a horizontal plane while connected to the submerged wire, but no directional effects were observed. As in the previous experiment, to eliminate howling, it became necessary to shunt the input terminals of the amplifier with a small capacity. Radio signals from nearby land stations, and telephone conversation from a Navy airplane in flight were heard by this method.

To make certain that in the above experiments the bare wire constitutes the necessary connecting link between the two stations through which the high frequency current flow takes place, and that the energy is not in some way transmitted entirely or in part through the body or over the surface of the water, the following experiment was made. The connections are shown in Fig. 5. The line consisted of a bare copper wire approximately 22 feet (6.7 m.) in length, of which 16 feet (4.9 m.) were submerged in the water, the outer end of which was left free. The other terminal was connected to two metallic ground stakes buried in the earth to a distance of about 2 feet (0.61 m.). The average distance between the ground stakes and the water was about 4 feet (1.2 m.). The transmitting wave-length was 1,050 metres, as in the Fort Hunt-Fort Washington tests, and maximum current obtainable 200 milliamperes. In contrast to the results obtained in the preceding tests, it was impossible to get any marked resonant effect with this short submerged wire. As the series capacity, C, Fig. 5, was increased, the line current slowly increased but did not, however, reach a resonant maximum value.

The receiving apparatus used was identical

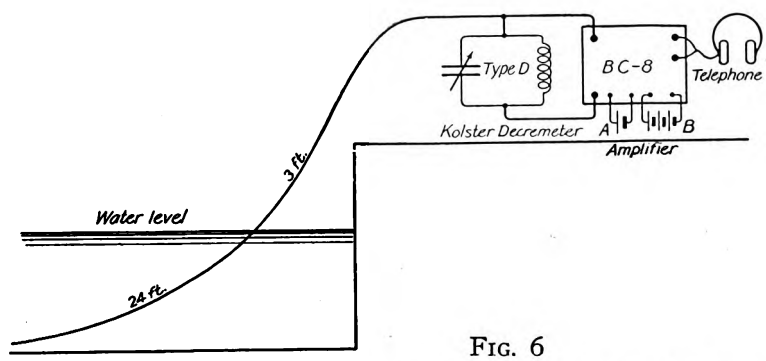

FIG. 6

with that employed in the preceding test. The distance separating the two stations was approximately 2,000 feet (0.6 km.). At the receiver, the line consisted of 27 feet (8.2 m.) of bare wire, of which 24 feet (7.3 m.) were immersed in the water, leaving 3 feet (0.9 m.) exposed. A type D, Kolster decremeter and a type BC-8, Signal Corps amplifier served as a receiver, the connections being as shown in Fig. 6.

With this arrangement, employing no ground connection, and with the transmitter operating as described, using buzzer modulation, no signals were received. Employing the submerged wire as a ground, and a wire of about 60 feet (18.3 m.) in length laid upon the stone sea-wall as an antennae, time signals were received from the Navy Station at Arlington, Virginia, but no signals were received from the transmitter at the other side of the river. Using the connection shown in Fig. 6, it was impossible to receive signals even from the Arlington Station.

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It is evident from the negative results of the above test, that the high frequency current flow must be confined more or less to the bare wire connecting the two stations. We are not prepared at this time to offer any explanation regarding the actual mechanism of the energy transfer. It may well be that the bare wire functions as a guide, the electromagnetic energy being confined to a finite cylindrical layer of water surrounding the wire. But whatever the true explanation may prove to be, it was established by these experiments that high frequency currents can be transmitted on bare wires submerged in fresh water.

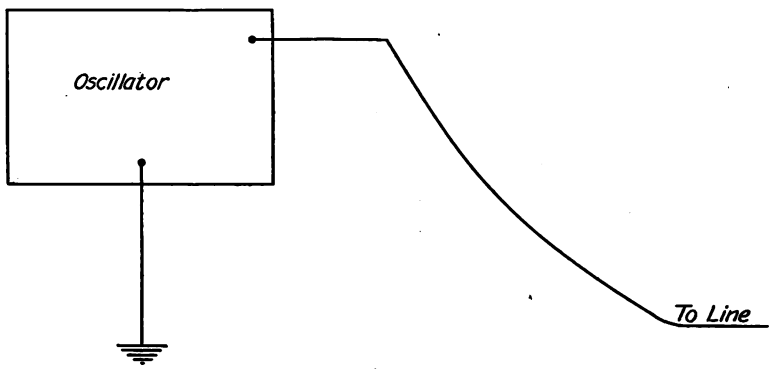

FIG. 7

EXPERIMENTS WITH BARE WIRES LAID ON THE GROUND

The Signal Corps is now required to furnish lines of inter-communication in each of the three media, viz., air, earth and water, or any combination of these. As examples: (1) one airplane to another airplane, (2) one military dugout to another military dugout, and (3) one submarine to another submarine, both submerged. The earth crust consists of such widely different character of materials, depending upon the locality, that the propagation of electromagnetic waves in this medium should in general differ with the particular character of the earth. Water, on the other hand, being a much more homogeneous medium, should exhibit more regular and orderly results, and this in general has been the experience thus far in these experiments.

The work at the radio laboratories at Camp Alfred Vail, Little Silver, New Jersey, was confined to experiments on the propagation of electromagnetic waves over bare wires laid on the surface of the earth or completely buried in the earth, the object being a study of the effect of the earth as a surrounding medium. Many experiments were made to obtain information of the various factors which may have an influence on the final results. It would make this paper too voluminous if an attempt were made to recount here in detail all of the experiments. It will suffice, therefore, to give only a general summary of the methods employed and the results obtained.

No attempt has been made to determine to what distance these methods may be made effective for the transmission of messages.

Tests were carried on between the main laboratory and a small field laboratory one and three-quarters miles distant (2.8 km.). A bare No. 16 wire was laid on the surface of the earth connecting these two stations. The radio telephone instruments used at each end were the standard Signal Corps SCR-67 sets, which comprise an oscillating transmitter of the electron tube type. The schematic diagrams of the transmitter and the receiver are shown in Figs. 7 and

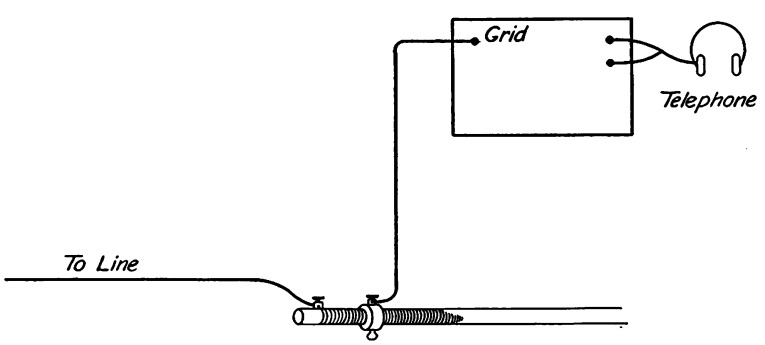

FIG. 8

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8. The transmitting current was about 100 milliamperes at any of the wave-lengths available with these sets, which covered a range of

FIG. 8

approximately 200 to 550 metres. Good telephone communication could be maintained between these two stations with the above equipments.

Tests were also made to ascertain if any standing wave formation occurs on the line. The method used was to get the current intensity at different points on the line by opening it at different points and inserting a hot wire milliammeter. At distant points where the current was very small, the hot wire milliammeter was replaced by a low resistance thermo-couple and a single pivot microammeter. It was found that the current continually decreased with the distance from the transmitting end. The line was then cut at a point three-eighths of a mile (0.6 km.) distant from the transmitting station and left open. Ammeters inserted at intervals along this section of the line at once indicated the existence of standing waves.

(To be Continued)

THE HIGH SPOTS IN MACHINE SWITCHING TELEPHONE EQUIPMENT

By D. E. WISEMAN

Plans are underway looking to the installation of an automatic telephone system in the city of Seattle, Wash., the first units to be placed within the next year.

Considerable matter has already been written on the subject of machinie switching, but in the following is given the "high spots" of the equipment and the methods employed in a large automatic installation.

(a) The major units of machine switching equipment consist of line finders, district selectors, incoming selectors, final selectors, impulse translating apparatus, miscellaneous operating and intercepting positions, fixed and portable test units, charging and house power plant, distributing frames and racks.

(b) Power plants are complex, and the operation and regulation will require more exacting supervision than for manual practices. In the approved new main office, Seattle, the power plant will include:

A 250-horsepower direct connected, gas engine alternator set for use in case of failure of the primary power.

Motor generator sets for charging the storage batteries.

Emergency battery driven alternator set.

Two hundred small motors for continuous driving of selector frame mechanisms.

Contactors for automatically changing the power source on drive motors in case of power failures.

Four "H" type batteries of 12 cells each.

(c) Thirty-eight sections of high type toll board will be provided with the new main office, Seattle, having the latest features for operation with machine switching equipment and including a mechanical ticket—distributing system and toll test facilities. The plans provide for initial and ultimate requirements for repeater and Morse equipment, printing telegraph, and also for telephone and telegraph carrier systems.

(d) Machine switching equipment provides for individual and party flat rate, coin collect and message service, collecting or refunding coins, operating or non-operating registers, depending on the service rendered.

(e) Machine switching subscriber stations will have the same functions as manual stations, with the exception of the additon of a dial for transmitting electrical impulses.

(f) Private branch exchange switch-boards will have the same functions as manual boards, with the addition of a dial for each position. The trunk and cord circuits will require modifications to function with the new central office equipment.

(g) The outside plant, land and buildings requirements and also transmission will be fundamentally the same as for manual equipment.

(h) Calls from manual stations to manual stations will be completed as at present.

(i) Calls for machine switching stations to machine switching stations will be obtained direct by dialing two letters and four digits.

(j) Calls from machine switching stations to manual stations will be obtained by dialing the required number, which will appear on an illuminated screen in front of a trunk operator at the proper manual unit. The connection will be completed direct by plugging into the corresponding subscriber multiple.

(k) Calls from manual stations to machine switching stations for all offices except Main, Elliott, and Queen Anne will be completed direct by the "A" operator by means of key indicator equipment. The operator presses an order wire key connecting with the particular machine switching unit required, and a non-busy trunk is selected mechanically. The corresponding number of this trunk will be shown by lamps in the trunk indicator in front of the operator so that she can connect with the trunk assigned. She then sets up the four digits of the number required on her numerical keys transmitting the impulses necessary to complete the connection to the called station.

(l) Calls for manual stations to machine switching stations from Main, Elliott, and Queen Anne offices will be completed by a cordless "B" operator in the machine switching office, during the short period elapsing between the cut-over of the first machine switching offices and the offices above noted. Such calls will be passed from the "A" operator to the cordless operator over a call wire. The cordless operator then plays up the number required on the set of numerical keys transmitting the impulses necessary to select the required station.—*Pacific Telephone Magazine.*

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A NEW PRINTING TELEGRAPH SYSTEM

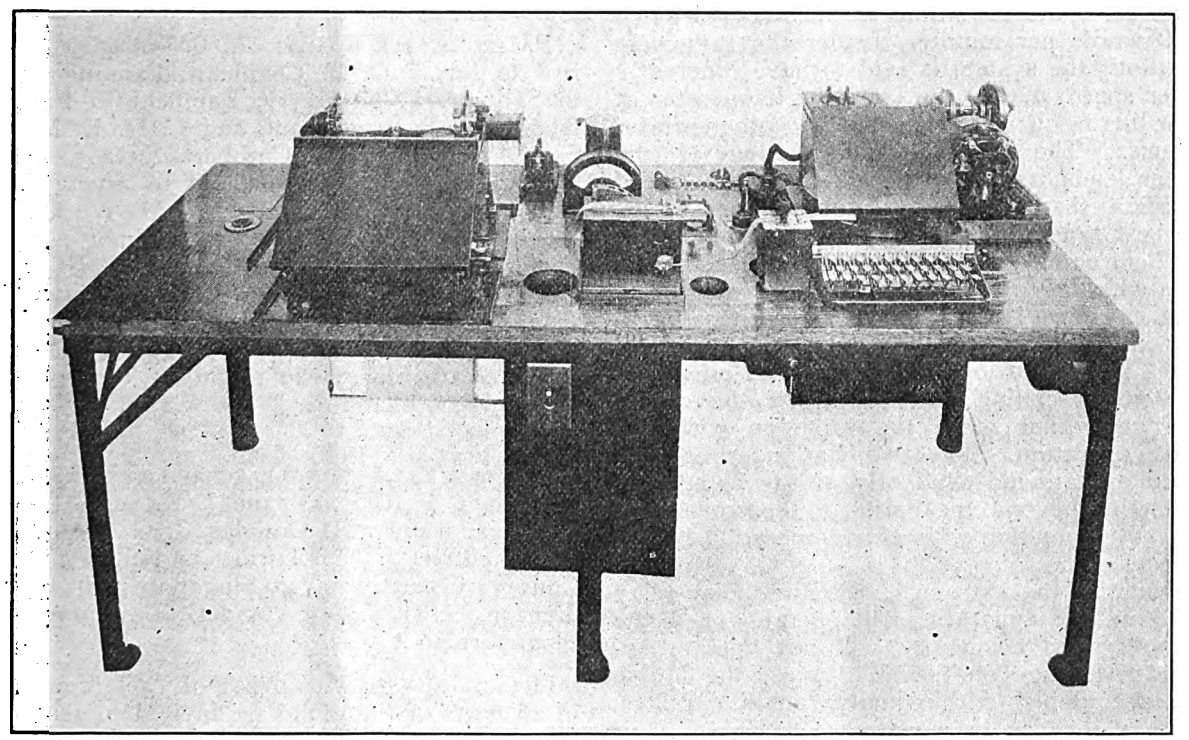
May Be Used on Way Wire Circuits.

The accompanying photographic reproduction is of an improved, simplified printing telegraph system recently brought out by Kleinschmidt, of New York.

The illustration shows a duplex transmitting and receiving outfit complete. Where service conditions do not require duplex operation the artificial line resistance and condenser shown at the rear toward the right of the table are eliminated.

The message is prepared in tape stencil form in the perforator which has the standard typewriter keyboard (minus the lower case letters) and employs the Baudot multiplex code. The stencil tape, after four or five inches have been cut, is started in the automatic transmitter with the automatic switch lever floating on the tape. Assuming the typist operates at greater speed than the transmission speed of 60, 70 or 80 words per minute (as the case may be) there is an accumulation of slack in the tape and this lever remains down—the transmitter automatically sends the positive and negative impulses through the distributor to the line. If the operator completes the messages on hand or operates at a lower speed than the transmission speed then the tape tends to become taut, lifting the automatic lever and cutting the transmitter out of the circuit. When more tape is cut in the perforator, at first the tape becomes slack, then the lever drops and the transmitter is cut in circuit again.

At the receiving end the impulses are received through a polar relay and distributor controlling the local receiving circuit. These impulses operate the proper printer magnets, reproducing in succession on the printer carriage the characters indicated on the stencil tape at the distant transmitting station.



Operating duplex, no particular attention is required for the receiving printer. The transmitting operator can tear off the incoming messages one by one at intervals in transmitting. The Morse key and sounder are furnished for signaling in balancing duplex, etc., but the bell sigal of the distant printer can be operated for various signaling purposes by the signal arm of the local transmitter. A bell signal code for "Start," "Stop," "Repeat," "Reperforate and Repeat," etc., etc., can be readily arranged.

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The apparatus in general operating characteristics is similar to that used in the Western Union multiplex system. In fact, the printer unit is practically the same as the Western Union standard.

The present model has one-third less parts than the next preceding model and embodies the suggestions of the Western Union engineers for improving operation and reducing maintenance as a result of four years' successful operating experience with a large number of the previous model.

Tests of this printer of four months' duration have resulted in continuous runs up to 56,000 words without errors and the operating difficulties and service interruptions for maintenance have been practically negligible. These tests are equivalent to at least an equal period of normal operation in railroad message traffic or other industrial or commercial service.

The speed of operation can be increased to 80 words per minute on good lines and the average for all sorts and conditions of lines should be 60 to 70 words per minute. Under the same line conditions the system is said to have inherently higher speed, due to the fact that it operates at lower line frequency per letter than other printer systems. The type-bar construction of the printer lends itself more readily to high speed operation than does the ordinary type-wheel. The best typewriters are type-bar machines and the Kleinschmidt printer is merely an electrically operated, ruggedly constructed typewriting machine capable of all ordinary typewriter operations, including the making of carbon copies.

It is possible to operate this printer on a way wire circuit calling any station on the circuit from any other office the same as with the Morse operation. The two stations thus connected operate independently of the balance of the circuit beyond the limits of the connecting wire, corresponding with Morse operation in this respect.

Owing to the extremely sensitive polar relay employed the apparatus will operate when the Morse system frequently will not operate because of leakage on the line, unless the Morse line is equipped with equally sensitive relays, which is not usually the case.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

Cable Staff Transfers

EASTERN TELEGRAPH COMPANY: S. H. Davis, Malta to Alexandria; H. S. Hockaday, Aden to Marseilles; P. G. Langston and J. C. Bertram, Vigo to Marseilles; A. T. Coombes, Bombay to Durban; F. M. Blunden, J. B. Salt and F. A. Bowen, Gibraltar to Suez; C. B. Cooper, Suez to Aden; R. K. Caston and A. F. G. Brumby, Aden to Zanzibar, and H. Gibbons, from London to Malta.

WESTERN TELEGRAPH COMPANY: E. P. Hunter, from Rio de Janeiro to Santos; C. A. Arden, Montevideo to Port Stanley; W. B. Jones, Buenos Aires to Port Stanley; D. G. K. Kelsey, Montevideo to Port Stanley; L. H. Low, Pernambuco to Montevideo; A. G. Douglas, Pernambuco to Rio de Janeiro; R. Lunnon, Buenos Aires to Montevideo; H. P. Spencer, Port Stanley to Valparaiso; C. A. Scarth, Montevideo to Santa Catharina, and A. J. O. Jones, Madeira to Pernambuco.

PACIFIC CABLE BOARD: A. B. Gallagher, Montreal to Suva; H. F. Chapman, Fanning Island to Sydney; F. N. Harry, Bamfield to Fanning Island; T. P. Brughmann and L. H. E. Martin, Suva to Bamfield; R. Cuthbert, Suva to Auckland; E. H. Martin, Auckland to Suva; J. M. Croger, Sydney to Bamfield; A. M. Woolfe and J. M. J. Askew, Sydney to Southport; R. V. Cotter, Norfolk Island to Sydney; J. E. Hyde, Calgary to Montreal; L. A. Clarke, Montreal to Calgary; W. B. Sutton, Montreal to Fort William; H. B. Freeman, Suva to Fanning Island; F. E. Noad, Melbourne to Suva; T. F. Evans, L. G. Bartley and I. J. Kenneally, Sydney to Suva.

EASTERN EXTENSION TELEGRAPH COMPANY: F. C. Pepper, E. J. Smart and J. K. Inge, Darwin to Singapore; C. H. Douglas, J. G. Lawrie, H. K. Crichton, L. T. Turner and J. F. M. de Courcy, from Cocos to Singapore; F. B. Eddington, G. L. S. Grant and G. Lavender, from Singapore to Cocos.

OFFICIALS AND EMPLOYEES of cable companies in all parts of the globe are invited to send personal news items or other news notes of interest to the editor of TELEGRAPH AND TELEPHONE AGE.

Marine Towers Returned to Telegraph Companies

On July 1, all of the marine observation towers situated along the coasts, owned by the telegraph companies, were returned to the companies by the United States Navy Department. The operation of the towers, including the management of signaling methods, telegraph and telephone lines, has been in charge of the Navy Department since 1918.

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser"

(*Continued from July 1 issue*)

Working Arrangements—Continued

Fig. 9 shows cable signals as they appear on the paper tape as perforated by a three-mallet punch, or keyboard perforator, ready for passing through the automatic transmitter to line. Fig. 10 shows the signals of the alphabet as

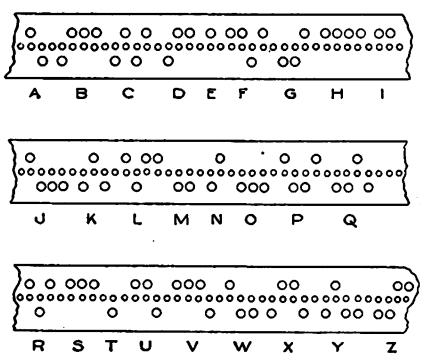

Fig. 9

reproduced at the receiving end of the cable by a siphon recorder.

It should be remembered that the Continental Morse alphabet is used, and if the student keeps in mind that movements of the siphon to the left represent dots and movements to the right dashes, the signals are not difficult to read.

The mallet perforator has three keys; the left key when depressed perforating dots; the middle key spaces, and the right key dashes. Small

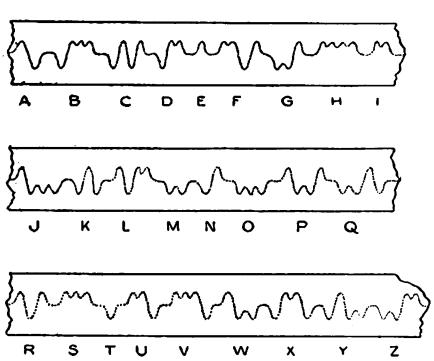

Fig. 10

punching sticks made of hardwood or metal and tipped with rubber inserts are used to operate this type of tape perforator. An experienced operator using a mallet punch can perforate cable slip at the rate of 130 letters per minute—26 words per minute.

In present practice the mallet perforator is gradually being replaced by keyboard perforators. With the keyboard perforator the depression of a letter key sets up combinations of steel punches which then are driven through the paper tape by means of a powerful electromagnet—the action of the magnet also stepping the tape forward into position for the following letter.

An experienced keyboard operator can turn out 260 letters per minute (52 words per minute) with less fatigue than half that number of words can be perforated by means of the mallet punch.

On many cable circuits magnetic shunts of low ohmic resistance and of high inductance are employed. Generally, these are connected across the bridge arms. Upon cessation of the signal impulse the "back electromotive force" assists the prompt return of the marking siphon to the zero line; or, at least toward the zero line. The shunt is also of value in draining off earth currents from the recorder circuit due to the fact that the low ohmic resistance permits these slow moving currents to pass by the relatively high resistance recorder coil winding. Perhaps the most beneficial effect of the shunt circuit is to straighten out the signals, making them more legible when recorded on the tape.

The series resistance of the magnetic shunt, referred to in the July 1 installment, controls the rate of flow of current through this part of the circuit and has a marked effect upon the character of the signals.

Balancing

In balancing a cable circuit the following procedure will be found serviceable:

"After making sure that all wire connections are properly made and that the recorder coil has the low ohmic shunt in circuit, begin by tapping one of the sending keys and observe in which direction the siphon is deflected. It may be noted whether the cable or the artificial line is getting more than its proportion of the current. Slow movements of the siphon in response to the key taps indicate that the remedy of balance lies at the end of the artificial line, while rapid movements of the siphon point to the remedy being applied at the beginning of the artificial line. Changes may be necessary in the first resistance box of the artificial line; changes in the values of R′ (Fig. 6) or in the subdivided condenser.

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"As the balance improves, gradually open the shunt circuit around the recorder coil. It is well to remove the cause of the rapid disturbances first. These disturbances are, in cable parlance, called 'jar.' The jar may be corrected by adjusting the one-fourth ohm rheostat; the subdivided condenser, or the resistance R'. It is best, if possible, to keep the one-fourth ohm rheostat on its center point. By inserting a low resistance in the path of the first three or four capacity terminals, sometimes the jar may be removed.

"Refinements of balance may be made by adjusting to fractions of an ohm in the box R', and by adjusting to hundredths of a microfarad in the subdivided condenser.

"If the jar cannot be eliminated by adjusting the one-fourth ohm rheostat, subdivided condenser, or resistance R', try a leakage circuit at the outer end of the line—the correct position to be determined by experiment. Or, it may be necessary to insert another capacity resistance unit at the beginning of the line. Leaks at the end of the line are beneficial in eliminating the wave in a duplex balance. On long duplex circuits the end of the artificial line is generally left free. Shunts of 20,000 to 250,000 ohms across two resistance terminals of the artificial line have the effect of lowering the resistance between the sections embraced. This, of course, lowers the ratio of the resistance to the capacity of that portion of the line as well as increases the capacity of this part of the line. This is beneficial in balancing the rate of charges so as to make it correspond to the values in the real cable.

"At times, also, it is necessary to free one or more capacity terminals. Of course, conditions at both ends of the cable in regard to the "hook-up" must be practically the same. Adjustments near the home end have a marked effect upon the balance and small changes near the beginning of the line produce greater results, comparatively, than large changes further along.

"The correct position for a leak contact sometimes may be gauged by placing a finger on a line terminal and with the other hand touch an earth terminal. The best earth connection for the cable duplex is the sheathing of the cable itself.

"Should the balance vary as the keys are manipulated it is possible that a surface leakage exists in the artificial line. This condition may also point to a fault developing in the cable conductor.

"The insulation of all apparatus in the bridge circuit should be high, and maintained as nearly perfect as possible."

Apparatus Required in a Set

For duplex working the following instruments and equipment are necessary:

Terminal line-battery, total voltage 50.

One set of sending condensers (line side 40 to 80 microfarads).

One set of sending condensers (artificial line 40 to 80 microfarads).

One apex resistance unit in tenths of an ohm.

One signaling key.

One automatic transmitter.

One siphon recorder.

One spare recorder suspension.

One receiving condenser (40 to 80 microfarads).

One resistance shunt for receiving condenser—up to 10,000 ohms.

One magnetic shunt—value to suit the cable.

One rheostat for series resistance of magnetic shunt.

One artificial cable representing electrical characteristics of the real cable as nearly as possible.

One subdivided condenser—divisions as low as one-hundredth microfarad.

One rheostat from one to 100 ohms.

Two rheostats from one to 500 ohms.

One rheostat from 1,000 to 200,000 ohms.

Two rheostats from one to 10,000 ohms.

One reliable set of lightning arresters.

The information given in this instalment is the kind of instruction which should be preserved by students who are now engaged in studying cable operation or who are likely ever to be identified with cable work. The procedure in balancing is first hand information and was framed by the writer after long experience in supervising the operation of long submarine cables.

(To be Continued)

AMERICAN CABLES OPEN TO BRAZIL—REDUCTION IN RATES ANNOUNCED

The announcement has come from All America Cables, formerly the Central and South American Telegraph Company, of the establishment of direct cable service between the United States and Brazil.

For more than fifty years this American cable system has endeavored to secure entrance into Brazil, but has been unable to do so because of exclusive concessions enjoyed by foreign cable interests. The exclusive concession of the Western Telegraph Company (British) from Brazil southward expired in 1913, and, after protracted litigation, the Supreme Court of Brazil decided that the Brazilian Government might legally grant cable rights to the American company. Such a contract was made with the All America Cables, and in May of this year two cables of the most improved type were successfully laid to Rio de Janeiro and Santos, and are now open to the public for business.

The Western Telegraph Company still enjoys exclusive inter-State concessions in Brazil, but

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strenuous efforts are being made by the All America Cable system to provide wholly American-owned cable communication over American-owned cables that is now assured to Rio de Janero and Santos in the south.

John L. Merrill, president of the All America Cables, said recently: "The opening of American-owned cable communication between the United States and Brazil marks an epoch in the history of our company, and the United States Government and the United States merchants, as well as the commercial interests in Brazil and South and Central America are to be congratulated upon the establishment of this service, which the Western Telegraph Company has so long and so persistently blocked. We expect," said Mr. Merrill, "to maintain in our Brazilian service the reputation which we have won for our efficiency, speed and accuracy, and, of course, we shall continue to be the pioneer of fair cable rates. The charge of profiteering cannot be laid at our doors. It will be recalled that in December, 1917, when the cost of everything else was mounting higher and higher, we voluntarily made a reduction in our rates of nearly 25 per cent.

"From Brazil we hear that our victory for American-owned direct all American connection between the three Americas and the announced reduction in rates has caused much rejoicing among business men. By the establishment of our new cables, we have eliminated the discriminatory rate of about 25 cents per word exacted for telegrams heretofore filed with the Western Telegraph Company in Brazil and routed over our lines. I take great pleasure in announcing that from June 26 the rate from New York City to Brazil will be 65 cents instead of 85 cents, as it has stood for the past ten years.

"We fully realize the important part which cables play in the development of trade and the fostering of friendly relations between the nations, and we are quite cognizant of our responsibility in this direction. We feel that our stockholders have rendered a distinct service to the three Americas in the development of this American cable system, which now embraces over 22,500 miles of cables and land lines. Our cable system is duplicated throughout and in many cases triplicated. We have recently entered Bolivia and cables from Colon to points on the north coast of Colombia are now being laid. After this extension is made, the cable ship will at once lay a triplicate cable from Ecuador to Peru.

"Our company has faith in the development of Latin-America, and it will be my pleasure later to announce other extensions which will be of great value to the commercial interests of the world."

IN JULY the price of a Government one hundred dollar Savings Certicficate is $83.60.

SUBMARINE CABLE OPERATORS

To Be Trained at Columbia University, New York

Training in cable telegraphy has become a recognized branch of instruction in Columbia University. Thirty scholarships open to American citizens in every State have been provided in co-operation with the Central and South American Telegraph Company (All America Cables) as the beginning of a general plan of education which aims to train a corps of experts recruited from high schools to man the avenues of cable communication linking America with the outside world.

Dr. James C. Egbert, director of the Columbia Department of Extension Teaching, announced on June 26, that these cable telegraphy courses will open this Fall. The scholarships, Dr. Egbert said, will be open to graduates of American high schools. The recipients, all of whom must be American citizens, will be appointed upon the recommendation of the Columbia authorities.

Three scholarships of $600 each, provided for students in electrical engineering who are to study submarine cable telegraphy, have also been established. In a letter to William A. McLaren of New York, vice-president of the All America Cables, Dr. Egbert stated recently that these scholarships had been awarded to the following men: C. B. Isaacson of the class of 1921, School of Mines, Engineering and Chemistry; H. J. Rosenberger of the class of 1922, School of Mines, Engineering and Chemistry, and Frederick Dehls of the class of 1922, School of Mines, Engineering and Chemistry.

The All America Cables will provide employment for the holders of the scholarships immediately upon the successful termination of their work at Columbia. The disposition of the men who qualify for active service will, it is stated, naturally depend upon the exigencies of business at the time, but it is now felt that they will be needed most at the Canal Zone, at Lima, Peru, or at Valparaiso, Chile.

The instructors in the cable telegraphy course will be Walter I. Slichter, Professor of Electrical Engineering at Columbia, and Alexander Cunningham, instructor in the department of extension teaching. Describing the new course, Dr. Egbert said:

"This course is designed to give a training in both the scientific and technical principles of cable telegraphy, as well as in the manipulative skill and practice required to send and receive messages by the Morse code as used by the cable companies. It is intended to equip the student with that knowledge and skill required to become an operator and with sufficient scientific knowledge to assist him to rise to the position of chief electrician or superintendent of stations.

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"Approximately one-quarter of the time will be devoted to the scientific side, consisting of lectures, recitations and laboratory periods in the principles of electrical engineering, under the supervision of a member of the staff of the Department of Electrical Engineering.

"The remainder of the time will be devoted to practice in sending and receiving by the Morse code, reading messages in Morse code on tape and the practical operation and adjustment of the special apparatus used in cable telegraphy. This work will be under the supervision of a practical man with experience in the field and associated with one of the well-known cable companies.

"The laboratory facilities of the Department of Electrical Engineering will be available for the scientific work and a representative collection of cable instruments has been put at the disposal of the university and placed in its laboratories for the practical training.

"When the student has successfully completed the course he will receive a certificate stating that fact. The interest shown by the cable companies in the establishment of this course is an indication that these certificates will be favorably considered."

The thirty scholarships will be known as "All America Cables."

PROPOSED NEW SUBMARINE CABLES

Various announcements have been made from time to time regarding the laying of new cables, and the following particulars will show that cable factories will be very busy for some time to come: The Commercial Cable Co. contemplates the laying of another Atlantic cable. Another Atlantic cable is contemplated by the Imperial Government, and one between Scandinavia and America. The Eastern companies are laying cables between England and Gibraltar; Malta and Alexandria; Aden and Bombay; Gibraltar and Malta; Madras and Singapore. A duplication of the British Columbia-Fanning Island cable may also be undertaken. Further cables are to be laid between Miami and Barbados; Barbados and Para; Buenos Aires and Montevideo; Montevideo and Santos. The West Coast of South America Company intends extending its cables northwards; the Commercial Pacific Cable Company will be duplicating its cables and the South American Cable Company is establishing land lines betwen Buenos Aires and Montevideo, and laying a cable between the latter place and Rio Janeiro. There has also been talk of connecting San Francisco by cable to Central America.—*Electrical Review*, London.

In July the price of a Government five-dollar Saving Stamp is $4.18.

Hongkong, China, Cable Connections

Consul-General George E. Anderson, located at Hongkong, in a recent communication says:

"The cable service out of Hongkong directly or indirectly depends upon three concerns—the Great Northern Telegraph Company, a Danish corporation, which in a general way serves to the north and in Normal times connects with Europe by way of Siberia; the Eastern Extension Telegraph Company, a British corporation, which in a general way serves to the south and connects with Europe by way of Suez; and the Commercial Pacific Cable Company, an American corporation, which has no direct connection at Hongkong, but which carries Hongkong messages to the United States by way of Manila. There is also the Chinese Government's land telegraph service, which has an office in Hongkong and accepts business direct for transmission by land not only over China and to India, but to other countries by way of connecting cables at Shanghai or elsewhere.

"The Great Northern Telegraph Company has a cable from Hongkong to Shanghai, with a relay and transmitting station at Amoy. It has two cables from Shanghai to Japan and one cable from Japan to Vladivostok. Previous to the unsettled conditions in Siberia this company gave a regular and general European service and a service to the United States by way of its cables to Vladivostok via Shanghai and Japan and thence by way of Siberia and Russia. Since the war and particularly since the revolution in Russia, however, this route cannot be followed, and the company's business for Europe is turned over to the Eastern Extension Telegraph Company, the understanding being that the companies divide the charges evenly.

"The Eastern Extension Company has a cable from Hongkong to Shanghai; one from Hongkong to Manila and from Manila to Australia; two or possibly three cables from Hongkong to Singapore and from Singapore to India; and two from India to Suez, where business is turned over to the Eastern Telegraph Company, an affiliated concern.

"The Commercial Pacific Cable Company has cables from Manila to the United States by way of Guam and Honolulu. Business for the United States is handled through the Eastern Extension Company to the Commercial Company. The three concerns work in close co-operation."

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS

Clarence R. George, secretary of the International Association of Municipal Electricians, announces that the 25th annual convention of the association will be held in New Orleans, La., on October 19 to 22, 1920.

The various committees having in hand the technical sessions and entertainment, report that the New Orleans convention will be up to the Association's standard in all respects.

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AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Annual Convention Held at White Sulphur Springs, W. Va., June 29-July 1

At the Annual Convention of the American Institute of Electrical Enginers, held at White Sulphur Springs, W. Va., June 29-July 1, the various technical committees of the Institute submitted annual reports, which were read at the morning session, June 29.

The report of the Telegraphy and Telephony Committee, of which Donald McNicol is chairman, was as follows:

"Following out the plan adopted last year as to the form of annual report to be submitted by the committee, the following report includes references to technical progress only. The report is made up of contributions forwarded by each member of the committee.

Standardization

"During the past year considerable progress has been made in standardizing telegraph and telephone practices of the railroads of this country and Canada. Committees composed of representatives of the railroads, the commercial telegraph and telephone companies, and various manufacturers of apparatus, have prepared specifications for materials, apparatus and methods which, while conforming to the generally accepted standards in each case, include special features adapting them to railroad requirements. It is expected that these specifications will be formally adopted by the American Railroad Association in the near future, and that the desired approach to uniformity of practice will soon follow.

Toll Line Construction

"Toll circuits may be composed of either open wires on pole lines, aerial cable, or underground cable. Any one of these will give high grade transmission when improved equipment and methods of operation are used. Therefore, the tendency in toll line construction is to build a plant which will be most economical and at the same time reduce the cases of interference to service from storm breaks and various other troubles to a minimum.

"Underground cables properly installed and maintained are open to the least interference to service. However, it is not economical to place underground construction unless more than two full-sized cables are required. Generally, underground cables cannot be justified except between the larger centers and their suburban sections.

"Aerial cables are liable to less interference than open wires, but economy restricts their use largely to cases where the existing number of circuits and the rate of increase require extensive rebuilding, or additional pole lines to continue on an open wire line basis. Where the number of circuits will not justify aerial cable, open wire circuits must be constructed and maintained.

Underground Cable Construction

"No radical changes have recently been made in engineering or construction methods involved in connection with underground cables. The maximum size of cable used contains 1,200 pairs of No. 24 B. & S. gage wires. Experimental work is being carried on for the purpose of increasing the number of wires without increasing the diameter of the cable sheath.

"Troubles in underground cables have been due in part to disorderly arrangement of cables in manholes and the manner in which the splices were made. Great stress is now being laid upon the importance of having the manholes in good condition, supporting the cables in an orderly manner, and making splices with extreme care. The cost of labor required for installing underground cables is relatively small compared with the total cost of the cable in place, and therefore it is felt that all reasonable efforts should be made to install and splice the cables in such manner as to reduce the cable troubles to a minimum.

Inductive Interference

"The Railroad Commission of the State of California has recently published a comprehensive volume entitled 'Inductive Interference,' in which is given a large amount of technical information gotten together by the Joint Committee on Inductive Interference, which investigated this subject in California over a period of about five years. This volume makes available to interested parties a great deal of information of fundamental importance.

"The activity in both the power and the communication fields since the war has demanded renewed close attention to the study of inductive intereference.

"The growing use of electric arc furnaces which usually produce great distortion of wave form has given rise to serious new problems in noise interference prevention.

"The methods of overcoming interference with communication circuits from abnormal conditions on adjacent power circuits have not been so well developed as the methods of overcoming disturbances from the normal operation of the power circuits. Constant increase in the amounts of energy carried by power circuits has also made these problems more difficult. Especial attention must be given, therefore, to this phase of interference, particularly along the lines of limiting the number of abnormal conditions, reducing the length of time in which the circuits are abnormal and in limiting the magnitude of unbalanced power currents during such abnormal periods.

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"Information on the subject of interference from electric railways has been increased by two or three important investigations, but is still far from complete.

Printing Telegraph Tendencies

"While the invention of systems of printing telegraphs has been active substantially since the introduction of Morse's telegraph in the year 1844, the use of printing telegraphs on a commercial scale in America—aside from stock and news ticker systems—has been extensive only since about the year 1900. During the past twenty years improved printing telegraph systems have been extensively applied in moving traffic over trunk circuits where the volume of business is heavy and continuous. On the lines of the Western Union Telegraph Company practically 80 per cent. of the trunk line traffic is so despatched. The Postal Telegraph-Cable Company, on the other hand, makes no use of printing telegraph systems at the present time. On railroad telegraph lines printing telegraphs are used also to a large extent.

"The next stage of development—now very likely close at hand—is the application of printing telegraphs to wider uses and to circuits having a much lighter than trunk line traffic load. Extending to light-load circuits, the use of printer systems makes simplicity of operation, low first cost, and low maintenance cost of first importance.

"With the object of meeting the requirements for simplification, work is now under way with tape printing devices. Also, it is probable that two or three other systems of simplified telegraph printing will be given trials in service before long.

Radio Signaling

"The year 1919 has seen the application of discoveries and inventions which were necessarily veiled in secrecy during the years of war. Under stimulus of war necessity remarkable progress was made in the application and extension of the known principles of the art, standardization of radio apparatus and of its quantity production and use. These advances were made possible by the co-operation of industrial companies, their engineers, and engineers and scientists with academic connections. The efforts of these individuals or groups were ably co-ordinated and stimulated by the military and naval branches of the Government.

"Progress during the past year has been more in the nature of a consolidation of the scientific advances of the war time than in the nature of an entry into new fields. The entire art of radio communication now stands on a firmer base, with a greatly enlarged personnel of trained engineers and research investigators.

"Radio telephone communication was maintained between the seat of Government and the steamship George Washington, on which President Wilson made his European voyages. In these demonstrations the radio station at New Brunswick, N. J., was used.

"The guidance by radio of airplanes engaged in peace-time activities is well illustrated in the directing towards landing places of the planes of the Postoffice Department. Communication with planes on long voyages was accomplished in the memorable voyage of the NC-4.

"High-speed radio telegraphy has been greatly accelerated by the use of the Hoxie recorder and the Alexanderson magnetic amplifier. Direction-finding by radio compasses and its corollary of directive-receiving has been placed upon a firm scientific basis.

"The possibility of selecting signals with reference to their direction has been successfully applied by Weagant, Wood, Taylor, Alexanderson, and others, to the selection of desired signals and the discrimination against atmospheric disturbances and signals of foreign stations. These principles have also permitted engineering advances in duplex, or two-way operation of pairs of stations, and in increased possibilities of multiplex transmission and reception. Knowledge and experience along the lines of duplex and multiplex operation has given added interest to the questions of regulation of wavelength, range, and of the effect upon radio development of legislative action.

"In the manufacturing field there has been progress not only in standardization of apparatus and in better performance, but also in the production of equipment for high-power continuous-wave stations; compact and simple apparatus for medium-power stations and short-range sets suitable for amateur use.

"The withdrawal of military restrictions has resulted in a stimulus to amateur operation. By the encouragement of amateurs and of the research departments of the universities and engineering schools, the art should attract additional workers and provide for its future the necessary increase in an enthusiastic and well-trained personnel."

The following engineers are members of the Telegraphy and Telephony Committee: O. B. Blackwell, R. E. Chetwood, H. W. Drake, Arthur Bessey Smith, E. H. Colpitts, W. B. Kouwenhoven, L. F. Morehouse, R. W. Osborne, W. O. Pennell, L. M. Potts, S. A. Rhodes, D. M. Therrell, W. H. Winter and D. E. Wiseman.

Morkrum Company Staff Changes

The Morkrum Company of Chicago, manufacturers of printing telegraph machines, has established a sales engineering department, with J. O. Carr, manager, and J. B. Appleton, assistant manager. Both of these men have been with the company in engineering capacities for a number of years, and they are thoroughly conversant with every detail of the apparatus and systems of the company.

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Radio Telegraphy

HONOLULU FIRST WIRELESS ASSOCIATED PRESS BUREAU

Half-Way Station in Pacific Depends Entirely on Radio for Cream of News from San Francisco

By WELLAND R. GORDON
A. P. Correspondent in Hawaii

Honolulu bureau is The Associated Press halfway station on the wireless "line" that extends across the Pacific Ocean from San Francisco to Manila, nearly 7,000 miles. It was established in July, 1918, and was the first bureau to depend entirely on wireless for its service.

The main service of The Associated Press to the Hawaiian Islands consists of three files daily and three nightly. The day and night quotas approximate four hundred words each, the cream of the news as received in San Francisco. All files are closely skeletonized until they appear like code to the casual observer, although they are clear enough to the initiated. In addition to the regular files, there are day and night stock quotations, news of special interest to Hawaii alone, and EOS and "95" matter breaking outside of the filing schedule.

Both American papers in Honolulu are members of The Associated Press. One is a morning, the other an afternoon publication. The files as they arrive at the Honolulu bureau, also are relayed by wireless to the two members at Hilo, Island of Hawaii, the gateway to the great, active volcano, Kilauea.

The four member papers, particularly those in Honolulu, maintain elaborate libraries, reference files and morgues that would stagger the librarians of some of the great mainland dailies. Here are found, also carefully tabulated, the principal stories carried daily on the mainland leased wires, for the papers receive copies of the flimsy on every mailboat from the coast.

The net result is that from the four-hundred-word report each paper is enabled to rewrite and build up a front page and an inside that is remarkable for detail and accuracy in the face of the difficulties involved.

The city and county of Honolulu, which takes in the whole island of Oahu, has a population of 117,606, including a heavy majority of Japanese, together with native Hawaiians, Portuguese, Spaniards, Filipinos, Chinese, Koreans and Porto Ricans.

With such a cosmopolitan population, two American dailies, four Japanese dailies, one of which recently applied for membership; four Chinese papers published three times a week; three Hawaiian weeklies; one Portuguese weekly and one Korean weekly, Honolulu is a paradise as a news-gathering center.

Much of the material is sent to San Francisco by wireless, some of it coming from the Orient through sources outside The Associated Press, but the greater bulk goes into the mail service.

A bureau without a wire, 2,100 miles across the ocean from San Francisco, its divisional headquarters, picking its news from the air, might be expected to present the minimum of trouble. The first appearance of static shattered that belief.

The radio expert doesn't seem to be able to define static. The best he can do is to tell you what it isn't. When static conditions interfere with wireless the sounds that enter the ear pieces of the radio receiver resemble a succession of miniature thunderclaps which entirely obliterate the message. From this it may be gathered that the chief burden of the Honolulu correespondent's daily prayer is that static be eliminated.

The report that comes to Hawaii from San Francisco is addressed in multiple to Manila as well. It is relayed from Hawaii to Guam, 3,337 miles farther on, and from there to Cavite, near Manila, another 1,500 miles.

Honolulu bureau keeps in touch with the progress of Manila's service, eliminates errors in transmission from San Francisco, and when static is bad in the Orient or the traffic is jammed for some other reason, cuts the Manila report to bare essentials so that some of it at least may get through. Cutting a four-hundred-word epitome of the world's news to two hundred, and in extreme cases to one hundred words, and at the same time giving Manila representation on all the high lights, is a heartbreaking task.

Manila news radiograms traveling to San Francisco are dropped at Honolulu for distribution to the Hawaiian members, while duplicates of mail stories sent by the Tokio, Shanghai, Peking, Manila, Papeate, Tahiti; and Pago Pago, Samao, representatives of the Associated Press to San Francisco and New York also come to the Honolulu bureau for manifolding and distribution in Honolulu and Hilo.

The bureau at the "Cross Roads of the Pacific," the entrance to the funnel of Oriental traffic, views an almost daily kaleidoscopic succession of interesting personages and happenings. When the Prince of Siam goes to or returns from the United States he passes through Honolulu. If Admiral Viscount Jellicoe inspects His Britannic Majesty's Pacific possessions he touches at Honolulu. Does

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the Prince of Wales travel to the Antipodes he visits Honolulu en route. Should a Japanese diplomatic mission go to Paris to help make the world's peace, it spends a few hours in Honolulu.

About the necks of them all Hawaii hangs its "leis" of flowers and sends them on their various ways with a hearty "Aloha."

The Wireless Station at Cocos

Recent light shed on the circumstances immediately preceding the destruction of the German raiding cruiser "Emden," Captain Muller, at the Cocos, or Keeling Islands, show that a "heathen Chinee" had a good deal to do with the luring of the wily, though very much overrated, Hun captain, to his doom when he landed his party to destroy the all-important wireless station there, on that 9th November, 1914. The station is on Direction Island, the most northerly of the Southern Keelings. A boat-load of Germans was sent from the "Emden" to destroy the station, and after landing they commandeered a Chinaman to lead the way, which he did by a circuitous route, having in the interim "given the tip" to a countryman to get there first, which he did, with the happy result that just in the nick of time the operator got through a message which was picked up by H. M. A. S. "Sydney" (Capain Glossop), and the "Melbourne" (Captain Silver). "Strange warship off entrance," it read, and "Full speed ahead," was the order to the cruisers, and the fate of the "Emden" was settled. Her party had lost a valuable hour in blowing up the wireless station and cutting the cable—the dummy one—for the genuine cable was never touched; the staff having rigged up a decoy cable. The Huns overlooked the fact that there was a duplicate set of instruments very cleverly concealed, with which the service was restored shortly after the raider fled to his doom. The Chinaman, who was a servant of the Cable Company, was suitably rewarded.—*Electricity*, London.

Radio Corporation of America Notes

J. Stanley Brown has been appointed receiving engineer, and assigned to the Lakewood, N. J., station for training.

Fred Johnson has been appointed receiving engineer, and assigned to the Lakewood, N. J., station as a senior.

At the Tuckerton, N. J., Station the following have recently been added to the staff: M. D. Kelly, H. Stange, T. Gale, R. F. Mott, H. J. Smith, Charles Buelow, W. Driscoll, J. Parker and V. T. Dungan.

A. V. Tyrell has been assigned to the Belmar, N. J., station as receiving engineer.

W. G. Lush, formerly Captain in the United States Army, and more recently in the service of the Shipping Board, has been appointed engineer in the Plant Engineer's office, New York.

John W. Swanson, manager of the new New York City station, WNY, during the war was radio inspector of the New York district, following which he served as Ensign in the Navy. At this station Mr. Swanson is assisted by L. C. Nunn and A. Darlington—both long experienced radio men.

Old Time Telegraphers' Reunion

Information received from Toronto points to this year's reunion of the Old Time Telegraphers' and Historical Association, which, in conjunction with that of the United States Military Corps, is to be held in that city, the dates being August 31 and September 1 and 2, being one of the most successful in the history of the organization.

The fact that the reunion is to be held in Canada seems to have excited unusual interest among the members of the Association, as many of them already have signified their intention of attending. It has also awakened the interest of many who are eligible for membership, but who, for one reason or another, have not hitherto connected themselves with the Association, with the result that a large number of new faces are certain to be seen at the approaching reunion. Many of these will be Canadian Old-Timers, as the Membership Committee at Toronto is conducting a vigorous campaign aimed at bringing into the Association all the telegraphers and ex-telegraphers in the Dominion not now members who are eligible under the rules as such.

The entertainment Committee has decided upon the programme for the three days of the reunion. This, briefly, is as follows:

Tuesday, August 31

Morning: Business meeting of the Association.

12.30 p. m.—Luncheon.

2.00 p. m.—Automobile drive about the city.

5.00 p. m.—Visit to Canadian National Exhibition.

7.00 p. m.—Open-air vaudeville performance at the Exhibition, followed by pageant, "The Empire Triumphant," and fireworks display.

Wednesday, September 1

7.00 a. m.—Trip by boat to Queenstown, and thence by scenic railway via the famous Gorge Route to Niagara Falls.

8.30 p. m.—Arrive back in Toronto. Music and dancing on board.

Thursday, September 2

9.00 a. m.—Visit to Canadian National Exhibition, with opportunity for lady visitors to do shopping, visiting, etc.

7.00 p. m.—Banquet at King Edward Hotel.

All who purpose taking in, or who are thinking of taking in, the Old Timers' reunion at Toronto this year will see from this programme that they may look forward with confidence to having a thoroughly good time.

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THE RAILROAD
TELEGRAPH AND TELEPHONE

H. HULATT, manager of telegraphs, Grand Trunk and Grand Pacific Railways, Montreal, Que., was recently elected an Associate Member of the American Institute of Electrical Engineers. He has also been elected a member of the Canadian Engineering Standards Association. Mr. Hulatt is well known in connection with the affairs of the Telegraph and Telephone Division of the American Railroad Association, and was recently appointed chairman of a subcommittee of the Engineering Section of the Railway Association of Canada, studying inductive interference.

J. C. RANKINE, superintendent of telegraph, Great Northern Railroad, St. Paul, Minn., was a New York business visitor on June 24 and 25.

Baltimore and Ohio Railroad

A CONFERENCE was held in the office of the superintendent of telegraph, Baltimore, at which the following Western Union officials were present: E. P. Totman, district plant superintendent, Philadelphia, Pa.; W. W. Olheiser, district plant superintendent, Pittsburgh, Pa.; E. J. Colwell, district foreman, and E. P. Murphy, chief clerk, Philadelphia.

W. C. DONNELLY is supervisor of time service for the Baltimore and Ohio system.

G. D. WARD, assistant manager of the relay office at Baltimore, Md., had the misfortune recently to lose by death his wife. He has the sympathy of the entire telegraph staff.

Telegraph and Telephone Life Insurance Ass'n

Assessments Nos. 678 and 679, as of July 1, 1920, have been levied to cover payments to the beneficiaries of John P. Shields, Albert G. Sillman, Frederick M. Briggs, George A. Riber, William Fellows, George W. Wood, Archie Lister, Frank E. Leefe and William M. Eggleston.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethlehem, Pa.

Shortage of Railroad Equipment

During the eight-year period from 1909 to 1916, the railroads of this country supplied a yearly average of 150,600 new freight cars, 3,180 passenger cars, 2,970 locomotives. During the war period the annual average was 75,000 freight cars, 850 passenger cars, 1,900 locomotives. In other words, the gross shortage of equipment to-day is 226,000 freight cars, 7,000 passenger cars, and 3,000 locomotives. The railway executives figure the imperative, immediate needs for equipment call for 100,000 freight cars, including 20,000 refrigerator cars, 2,000 locomotives, 3,000 passenger cars and 1,000 baggage cars, costing in round figures at present prices $610,000,000.

Railroad Freight Rates

There is only one way that the railroads can be put upon a substantial basis, provided with equipment adequate to their needs, and that is by an increase in freight rates, the roads having determined that the wisest course is to put the burden on freight rather than to distribute it between passenger and freight traffic. Their appeal is now before the Interstate Commerce Commission, and the next few weeks are to be consumed in hearings on the subject.

Press Operators Hold Banquet

At the Commercial Club in Davenport, Iowa, on June 19, the Associated Press Operators Good-Fellowship Club and the Tri-City Press Club gave a joint banquet which was attended by 150 telegraphers and newspaper men. The banquet table was equipped with a miniature telegraph system, including poles, line wire, instruments and real "juice" in the circuit. Throughout the proceedings the circuit was used by the telegraphers for communication purposes and for bulletins, flashes, etc., which kept the diners in real banquet humor.

Among the telegraphers present were E. E. Bruckner, W. W. Soergel, H. L. Dunn, Harry Downer, Robert Klauer, and H. Firth—the latter wire chief at Davenport for the American Telephone and Telegraph Company.

After the banquet the members were given an automobile trip over excellent roads throughout the surrounding country.

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ROBERT J. McINNIS

Chief Operator at Winnipeg

In the course of human events many changes occur. There was a time in the history of the arid and virgin West when there were no white natives, and it is but a matter of thirty years or thereabouts when the only white natives in Western Canada were children. As late as the year 1895 it was seldom that one met a railroad or telegraph man west of Lake Nipissing who had been born in that country. The ranks of the telegraph were recruited from Ontario, Quebec and the Maritime Provinces.

R. J. McINNIS

In the appointment, several months ago, of Robert J. McInnis as chief operator of the main office of the Canadian Pacific Railway Company's Telegraphs at Winnipeg, Man., there was brought to that position a native son of Winnipeg. Mr. McInnis was born in Winnipeg on December 16, 1879, and received his education in the public schools of that city.

When but fourteen years of age he entered the company's service as messenger boy, later being advanced to clerical positions where he had an opportunity to learn telegraphy. In 1898 he was appointed to a place as operator. Three years later he joined the migration of Canadian telegraphers who sought employment on Western railroads on the American side of the line, and after a year in the service of the Great Northern Railroad at Spokane, Washington, returned to the Canadian Pacific Railway and was assigned to duty in the Calgary, Alberta, office, where he remained from 1902 until 1920, serving progressively as traffic chief, wire chief and chief operator.

On August 1, 1915, he was appointed chief operator at Calgary, and it was in view of his close application to duty and intelligent management of that big office that he was on March 15, this year, advanced to the chief operatorship of the office at Winnipeg, Man.

Telephone Pioneers' Convention

The Telephone Pioneers of America will hold their annual convention this year at Montreal, Que., on September 10 and 11. This is the seventh annual gathering of the Society, and judging from the large attendance at previous conventions, it is predicted that a large delegation of the pioneers will be on hand at Montreal when this year's meeting opens.

A Special Telephone Pioneers' Limited train will leave New York on Wednesday, September 8, at 7.30 p. m., going via Albany, N. Y., Clayton, N. Y., Thousand Islands, St. Lawrence River and Lachine Rapids, arriving at Montreal at 6.15 p. m. on Thursday, September 9. The return trip will be by way of Lake George.

Telegram of Record Length

One June 19, there was filed at the main office of the Western Union Telegraph Company, New York, a night letter addressed to a firm in Los Angeles, Cal., which contained 52,386 words. The big message was sent to the operating room unchecked and transmitted in sections to Los Angeles over seven separate telegraph circuits, and was delivered to the addressee at 10 a. m. (Pacific time) June 30. The words in the message were counted at New York after transmission and the Los Angeles office advised of the total words for check.

This telegram was about ten times the length of an average Associated Press daily report received by city newspapers, and is perhaps the longest individual message ever handled in this country at message rates.

E. E. TRAFTON, telephone engineer of the Brooklyn Rapid Transit Company, New York, has invented a loud speaking telephone which is being adopted in the company's passenger cars for announcing street and station stops. The guard in one end of a car speaks into a transmitter and the voice is reproduced from receivers distributed throughout the car.

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Student's Course in Technical Telegraphy

No. 9

Pin-Jack Type of Telegraph Switchboard

The telephone companies early in their engineering work adopted the pin-jack for making circuit connections through switchboards. The advantage of the pin-jack type of connection over spring-jacks or strap-and-disk switching gear is that a large number of pin-jacks may be mounted in a comparatively small switch panel.

In telephone work, however, the current strengths employed generally are much lower than the currents of telegraphy. Where 24-volts direct current is applied to a telephone circuit, in telegraph working voltages as high as 400 may be used, and for many years the telephone type of jack was regarded as unsuitable for such high voltages. Later improvements made in the construction of pin-jacks resulted in their being used in telegraph offices to a limited extent: at first, as terminal contacts for wires leading to instruments on operating tables. As improvement continued in the design of pin-jacks their use was extended. Several years ago the Western Union Telegraph Company adopted this type of jack for use in main line switchboards and in new installations panels made up of a number of pin-jacks are assembled in the form of main switchboards.

The Postal Telegraph-Cable Company still uses strap-and-disk switchboards at large terminal offices, but the pin-jack board is finding its way into this company's service at many intermediate telegraph offices and in city branch offices. In the modern type of pin-jack freedom from operating difficulties and defects makes this practicable.

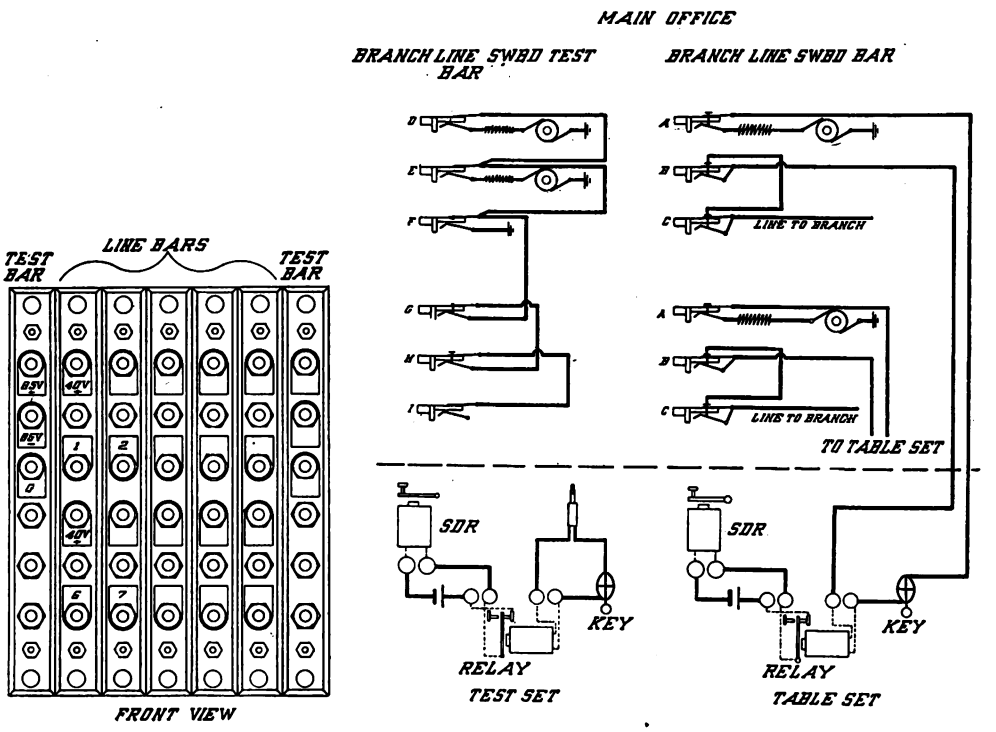

Fig. 22

Fig. 1 shows a type of branch line switchboard made up of pin-jacks mounted in strips of insulating material, used by the Postal Tele-

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graph-Cable Company. The pin-jacks are shown at A, B, D, E, F, etc.

The units are made of porcelain, each holding six jacks, and are mounted on angle iron. The usual assembly comprises two test bars to five line bars, ten lines.

Under normal conditions there are no cords or plugs inserted in any of the jacks and the board appears as shown in the illustration when all lines are in use.

D and E of the test bar are open jacks with positive and negative current, respectively. Jack F is also open with one side grounded. G and H are closed jacks and I is open.

A of line bar is a looping closed jack that can be used to cut in the test set shown. B and C are patching jacks that open the screw contact side when a plug is inserted.

A line is permanently wired to one side of jack C of line bar and the other side of C is wired to one side of B. The table loop is wired to one side of A and one side of B. The circuit starts at the generator and goes through the table set and grounds through the line at the branch office.

If it is desired to remove the battery from the line a hard rubber plug is inserted at A.

To move a table from one line to another a single conductor cord, equipped with plugs at both ends, is inserted at B of one line and C of the other. The plugs connect with the springs of the jacks, picking up one side of the table set loop at B and transferring it to the line at C. The other side of the table loop remains connected to the battery.

It will be noticed that after this operation the table and line left open are free to be either connected in a like manner or otherwise transferred.

In the event of trouble on a line, the line is transferred to a test bar by inserting the plug of one end of a single conductor cord in C of line bar and the other end of the cord in I of test bar. The double contact plug of the two conductor cord connected to the test set is inserted either in jack D or E to put positive or negative battery to line and to cut in the test set. If it is desired to earth the line and listen in, the test set plug is inserted at F.

When it is necessary to increase the line potential or to reverse the polarity, or to ground the line, one end of a cord with a plug that will pick up the body of the jack and leave the spring open is inserted at A of line bar and the other end of the cord is inserted at I of test bar. A solid brass plug is then inserted at D, E or F as desired.

This board is well adapted to city line use and is very flexible.

Fig. 23 gives an enlarged diagrammatic view of one type of pin-jack from which its operation may be studied.

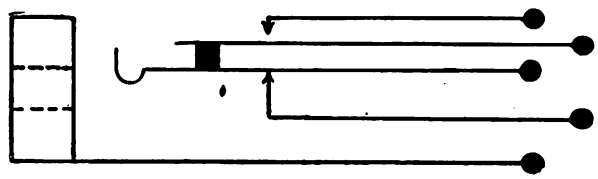

FIG. 23

In this jack contacts are provided for five wires, and it may be observed that if a plug is inserted into the hole represented by the dotted line the tip of the plug will encounter the looped spring strip, automatically raising the strip, thereby causing the second metallic strip to make contact with the top strip, and at the same time causing the third strip to part company with the fourth—the upper circuit being closed and the lower circuit opened. The slug connecting strips two and three is of insulating material.

Obviously, a jack made up in this manner may be used for various purposes. Assuming that only the third and fourth wire terminals are used and that a telegraph circuit is connected to those contacts. With no plug inserted, the circuit is intact and the current simply passes through the jack. If a plug is inserted which has a two-conductor cord attached to it it is evident that the current will have to flow through the cord circuit in order to reach a point beyond the jack; and, if the conductors attached to the plug are connected by wires to a telegraph relay or sounder, the current will operate the instrument so connected into the circuit. The plug is so constructed that the metal tip is insulated by a section of fiber and hard rubber from the longer metal section of the plug, and it is to these separate metallic parts of the plug that the cord wires are connected.

The longer metal section of the plug, when inserted, is in metallic contact with the frame of the jack, which in turn is connected with the lower wire terminal. In order, therefore, for the circuit to be completed as above suggested it is necessary to connect the fourth and fifth wire terminals by means of a short wire.

(To be Continued)

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

ANDREW S. WEIR, well-known Philadelphia telegrapher, has become a member of the brokerage firm of Butcher, Sherrerd and Hansell, of that city, with offices at 220 Real Estate Trust Building. The partners of the firm are members of the New York and Philadelphia Stock Exchanges.

T. J. GUILFOYLE, superintendent of Government telegraphs in Jamaica, is now in the United States on a combination business and vacation trip.

W. E. REYNOLDS, identified with the telegraph service of the Burlington Railroad System, Chicago, Ill., and inventor of the Tel-E-dot, which is now on the market, was a New York visitor last week while en route to Richmond, Va., his former home.

E. A. SHRIMPTON, recently appointed chief telegraph engineer of the Government telegraphs and telephones in New Zealand, will shortly visit England and the United States on a trip of investigation of telegraph and telephone systems. Mr. Shrimpton has been identified with the engineering branch of the Department at Wellington, N. Z., During the past twenty years.

W. L. MACLELLAN, in charge of the telegraph department of A. A. Housman & Co., 20 Broad Street, New York, has returned from a four weeks' trip to various cities. While away Mr. MacLellan enjoyed a combination business and vacation junket.

H. W. PENDRY, author of "The Baudot Printing Telegraph System," a work now in its second edition, was recently appointed assistant inspector in the Central Telegraph Office, London, England.

B. H. TIDRICK, of the Long Lines Department American Telephone and Telegraph Company, has been transferred from the Indianapolis, Ind. station to the Davenport, Iowa, station.

—o—

TELEGRAPH COMPANIES in the Dominion of Canada have been granted permission to increase the tariff on telegrams. East of Fort William, Ont., the average increase amounts to 32 per cent., and west of Fort William 20 per cent.

—o—

Postal Telegraph Cable Company

W. C. DAVIET, assistant to the general manager, is visiting offices in the first district, Southern Division.

JAMES P. O'DONOHUE, assistant chief engineer, is away on his annual vacation.

E. C. PLATT, treasurer, Postal Telegraph-Cable System, sails for Europe on July 17, accompanied by Mrs. Platt, to visit the grave of their son, the late Captain Edward Cuthbert Platt, Jr., who was killed in action in the war.

A. MONTUORI, of the general manager's office, is spending his vacation at Rockaway Point, L. I.

C. H. MAURER, of the city manager's office, New York, is spending his vacation at Delaware Water Gap, Pa.

THE COMPANY'S OFFICE at Chatham, N. Y., was in the path of a disastrous fire, which caused $25,000 damage in that city on June 9. Station Lineman Charles W. Daggett reached the office shortly after the alarm was sounded, and although suffering from a sprained ankle and moving about on crutches, rendered such aid to the fire fighters that practically all of the company's equipment and records were saved.

E. L. LANGENBERG has been appointed manager at Newton, Kansas.

A. L. BURNS has been appointed manager at Clinton, Iowa.

THE CONSTRUCTION DEPARTMENT has two large gangs at work reconstructing one of the main leads between New York and Boston.

—o—

Washington, D. C., Postal

J. L. CHAPPELL, of the Washington-Birmingham bonus circuit, has returned to duty after spending two weeks' vacation with his family at Colonial Beach, Va.

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JOSEPH CRANE, of the Washington-New York bonus circuit, has returned to duty after spending his summer vacation at Renovo, Pa.

PERCY CRENSHAW, of the Washington-Philadelphia bonus circuit, spent his vacation at Farmville, Va.

W. C. HOSPITAL, general wire chief, is spending the first half of his vacation in the country.

J. E. HILL, of this office, having been confined in the Sibley Hospital in Washington during the past six weeks due to illness, has returned to his home to recuperate, and expects to be on duty again before long.

Albany, N. Y., Postal

H. A. STRANG, chief operator at Utica, N. Y., has been transferred to the managership at Troy, N. Y.

D. H. GAGE, division engineer, has completed the installation at Plattsburg, N. Y., of additional generators and a duplex set, to facilitate the handling of the growing file from that office.

H. A. BENJAMIN has been appointed manager at Hudson, N. Y.

F. HART, operator in the Albany office, is spending his summer vacation at Kingston, N. Y.

W. A. ANDREWS, night manager of the Albany office, has returned from his vacation.

Buffalo, N. Y., Postal

H. D. REYNOLDS, superintendent of the fifth district, Eastern Division, has returned from a trip of inspection which included the following offices: Canandaigua, Penn Yan, Elmira, Ithaca, Cortland, Auburn, Syracuse, Oswego, Watertown, Alexandria Bay, Ogdensburg and Potsdam, N. Y.

L. C. DEAN and E. F. SUTER, operators from the Buffalo main office, are stationed at Syracuse, N. Y., for a few weeks, relieving during the vacation period.

W. A. MORAN, night chief operator, who has been on the sick list since May 6, has returned to duty.

THERESA KELLER, main office operator, is absent on her vacation.

ROBERT HUGENSCHMIDT has been promoted to a position as junior operator.

FRANCIS CORCORAN has been appointed operator at Oswego, N. Y.

THE OFFICE at Potsdam, N. Y., was moved recently to a new location, with Mary Geisel as manager. Superintendent Reynolds, in referring to the move, said: "In the year 1891, District Foreman I. Newton Smith was engaged in stringing a line from Syracuse to Ogdensburg, and I requested him to endeavor to locate some one in business in Potsdam who would learn to telegraph so that he could take charge of a telegraph office at that point. Mr. Smith selected a likely looking chap named John R. Weston, who ran a small bookstore, and prevailed upon him to learn the buisness. After some natural hesitation, and sundry skeptical glances at a card containing the Morse alphabet, Mr. Weston agreed, and in the course of time qualified for the place. After getting the hang of the business, he liked it so well that he retained the managership of the Potsdam office for twenty-eight years—until, in fact, his bookstore business grew to such proportions that he no longer had the time to attend to the wire work." Miss Geisel succeeds Mr. Weston as manager.

Seattle, Wash., Postal

F. A. STOCKING, SR., recently manager of this company's office at Ellensburg, Wash., is now in charge of the Government's radio station at Ketchikan, Alaska.

R. N. YOUNG, superintendent of the Canadian Pacific Railway Telegraphs, Vancouver, B. C., was a recent Seattle visitor.

J. J. LYNCH, superintendent of construction, Pacific Division, made an inspection of the lines through Montana in June.

B. W. FIELDS, division engineer, cut-over the new operating room at Portland, Ore., on June 22d.

G. T. MURRAY

Manager, Postal Telegraph-Cable Company, New Orleans, La.

G. T. Murray, who on June 20 was appointed manager of the New Orleans, La., office of the Postal Telegraph-Cable Company, gained his early telegraph experience while working as operator for the Western Union Telegraph Company, and the Chicago, Rock Island and Pacific Railroad.

In 1914 Mr. Murray entered the service of the Mackay Telegraph Company at Little Rock, Ark., and in September of the following year was appointed manager at Austin, Tex. After

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two years of service in that city he was transferred to Fort Worth, Tex., as manager, where he remained until his recent advancement to the managership at New Orleans.

The large increase in traffic handled at New Orleans and the constantly growing importance of that office constitute a task which can be handled best by a young man endowed with a good store of resource and energy. In these respects Mr. Murray excels, and it was in view of his satisfactory management of the Fort Worth office that he was selected to direct the company's business at New Orleans.

Receives Distinguished Service Cross

On May 30, 1920, Captain Abner H. Platt, a son of Mr. Edward C. Platt, the Treasurer of the Postal Telegraph-Commercial Cable System, was decorated with the Distinguished Service Cross by Brigadier-General De Bevoise in the presence of Troop F, First Cavalry. The following is a copy of the official notification of the award:

March 30, 1920.

From Major-General John F. O'Ryan to Captain Albert H. Platt, formerly Company C, 106th Machine Gun Battalion. Subject, Award of Distinguished Service Cross:

1. Official notification has been received of the award to you of the Distinguished Service Cross, as per the following citation:

"For extraordinary heroism in action near St. Souplet, France, October 17, 1918, Captain Platt, while moving forward in the attack with machine gun units encountered a number of stragglers in a sunken road. He organized these men into a company and led them in attacking waves. Later he personally led a patrol which located and silenced enemy machine guns which were firing from a flank position."

2. I take this opportunity of congratulating you and expressing my admiration for your fine record.

JOHN F. O'RYAN,
Major-General.

It will be recalled that Mr. Platt's eldest son, Edward Cuthbert Platt, Jr., who was Lieutenant in a Canadian regiment, having joined that regiment before the United States entered the war, was killed in action in France in November, 1917.

GEORGE W. HOWE, aged 80 years, a veteran telegrapher of the Civil War period, who has lived in retirement at North Thedford, Vt., for many years past, died at that place, on June 8th. This is the tenth veteran Civil War telegrapher who has died since the Cleveland reunion last September.

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, is on a tour of inspection to offices in the Pacific Division. After visiting other divisions en route east, Mr. Carlton will return to New York about August 1.

ALLAN WOODLE, city superintendent, Buffalo, N. Y., and E. F. Kelley, city superintendent, St. Paul, Minn., were New York business visitors during the week of July 5.

MISS K. O'FLANIGAN, secretary to the president, is away on her summer vacation, which she is spending in New Orleans.

WILLIAM FINN, of the engineering department, is enjoying his annual vacation at a seashore resort.

THOMAS E. FLEMING, of General Manager Carroll's office, and who is secretary of the Old Time Telegraphers' and Historical Association, reports that the attendance of old timers at the Toronto convention, September 1, promises to be large.

C. A. PLUMLY, superintendent of telegraph, Baltimore and Ohio Railroad, Baltimore, Md., was an executive officer recently.

S. H. STRUDWICK, of the cable service, now retired and living at North Sydney, Nova Scotia, is in New Work, taking treatments for eye trouble.

LOUIS CASPER, general inspector, and Mrs. Casper, announce the arrival of a son, Louis Duncan, on July 3.

RUTH KEIG has been appointed recreational director for Western Union Telegraph Company employees at Chicago.

IMPROVEMENTS CONTEMPLATED in plant and office facilities at Chattanooga, Tenn., are to be provided for by leasing additional space. Large floor area has been leased in the Richmond and News buildings.

New York Western Union

MARTIN DURIVAN, aged 63 years, a traffic chief on the Jerseys in the winter months, and since 1879 chief operator of the West End Long Branch, N. J., office in the summer months, died at the Fordham Hospital, New York, on July 1st. Mr. Durivan was born in New London, Conn., and had been identified with the telegraph service in New York City since 1873. His acquaintance with noted men of the country was extensive because of his many years of service at Long Branch, where he came in contact with the public. Mr. Durivan had charge of the telegraph service at Elberon Cottage, where President Garfield died, in 1881.

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First District, Eastern Division

AT WATERTOWN, N. Y., the American Block, in which the company has had its office for many years, is being razed to make room for a new building to be erected by the Woolworth Company. When the new building is completed the telegraph office will be moved into new quarters in this building.

W. A. SAWYER, superintendent, has returned from a trip of inspection which took him to all offices in the Adirondacks region.

MISS J. SULLIVAN, manager at Peekskill, N. Y., is absent on account of illness, and is relieved by Miss K. I. Mullen.

J. F. KIRBY, manager at Albion, N. Y., is on a furlough on account of illness, and is being relieved temporarily by Miss Grace Wilson, from North East, Pa.

C. O. FLINT, manager at Plattsburg, N. Y., has been transferred to the fifth district, Eastern Division.

MRS. ANNA M. WHEELER, manager at Ticonderoga, N. Y., has returned to duty after spending several months in New York.

MISS LORETTO FARLEY, of the general operating department, New York, has been transferred to the office at Lake George, for the summer months.

Western Union Lake Division

MRS. W. H. MILLS, secretary to H. C. Worthen, general manager of the Southern Division, Atlanta, Ga., was a recent Chicago visitor. Mrs. Mills, as Wilma O'Farrell, was Southern Division correspondent of the *Western Union News*, and Chicago people who had known her so well through that medium were glad of the opportunity to meet her personally.

IN CHICAGO, it is one convention after another. With the Republican National Convention out of the way we now have the Elks' Convention on our hands, which will bring 300,000 visitors to the city. A temporary branch telegraph office has been established in City Hall, where the Elks' Bureau of Information and registration office will be located.

C. M. MCCANN has started on a trip to the Pacific Coast, accompanied by his family, and intends visiting Los Angeles and San Francisco.

W. H. MILLS, traveling auditor of the Southern Division, was a recent Chicago visitor.

F. R. CARNEY, formerly manager of the office in the Railway Exchange Building, has been appointed district cable manager, vice T. F. Moran, promoted.

MISS GLADYS MAJOR, of Superintendent Brown's office, has returned from a vacation trip to California, where she visited her sister.

MISS FLORENCE LANTZ is visiting relatives at Teconsha, Mich., while on her summer vacation.

JEFFERSONVILLE, IND., office, which formerly was operated as a branch of Louisville, Ky., office, has been transferred to the second district as an independent office, in charge of Manager W. G. Strauch.

H. K. ARMSTRONG, manager at Anderson, Ind., has returned to duty after a spell of sickness.

B. A. ROMEYN has been appointed manager at Cadillac, Mich.

MISS SARA BOYD has been appointed manager of the summer office at Frankfort, Mich.

ALFRED C. SIMONSON has been appointed manager of the summer office at Whitehall, Mich.

RODNEY G. BRYSON, who worked as a telegrapher for this company at Cincinnati, Ohio, and who was one of the most popular men in the business, has filed papers in the Sixth District of Kentucky as a nominee for Congress. At the present time Mr. Bryson is a member of the Kentucky Legislature; being one of the youngest members of that body.

Lafayette, Ind., Office Moved to New Quarters

Lafayette, Ind., which became a functional office on July 1, 1918, and which handles about 20,000 telegrams per month, and is an important test office on trunk wires connecting with Indianapoils, Cincinnati, Columbus, Pittsburg, and Wheeling, was moved to new quarters recently, the equipment in every department being thoroughly up to date.

The operating room has six multiplex repeaters at the present time, carrying three multiplex circuits and one Morse circuit. There are four single line repeater sets, two quadruplexes and two half-set repeaters. The main swithchboard is of the new pin-jack type, made up of two sections, and has about eighty main line wires in and out connected through it. One section of the board is used as a loopboard, ticker panel, and clock and messenger wire terminal. The distributing frame and eight motor-generators are situated in the rear of the switchboard.

E. L. Dyer is manager of the office; Louise R. Seeger, cashier and bookkeeper; Mary Genbhart, telephone recorder; Lucile Waldron, delivery clerk, and C. H. Wible, night clerk. The traffic department employees are: A. Fried, chief operator; George Murray and Oscar C. Behrend, Morse operators; W. T. Wood, night wire chief; Robert P. Johnston, late night wire chief; G. C. Burton, station lineman, and Loretto M. Doran, office messenger.

The cut-over of the new office was made by Messrs. J. S. Strickler, of the equipment department; W. A. Boyce, foreman, and their assistants.

Richmond, Va., Operators Go to Conventions

Expert Morse telegraphers assigned to the national political conventions at Chicago and San Francisco include Edward Wilkinson, H. C. Burton, L. A. Powell, Charles Chappelle, S. N. Phillips, August Baker, Granville Stagg and W. B. Hughes.

The enormous amount of telegraph traffic han-

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dled at the national political conventions always calls for the selection of the fastest senders among the operators in order that the business may be moved promptly. A convention, if it lasts more than two days, requires the transmission of about one and a half million words. The Republican National Convention of 1912 had a rather high score, as on that occasion about four million words were transmitted by the telegraph companies.

Western Union, Gulf Division

J. F. WILSON, for some years district commercial superintendent in the Southern division, was recently appointed district commercial superintendent of the first district of the Gulf Division, with headquarters at Dallas, Texas.

B. D. BARNETT has been made division commercial manager of the Gulf Division, in charge of office systems and methods.

G. P. BRINKLEY, formerly of the Central Division, has been appointed division commercial manager, in charge of development matters.

P. R. NAPIER has been made division commercial manager in charge of messenger matters.

F. A. MOHR, general manager, has returned from an inspection trip to the principal offices in Oklahoma, Eastern Texas and Arkansas. He reports a remarkable development of business at the offices visited.

H. L. MASON, formerly manager at Beaumont, Texas, has been placed in charge of the claims desk in the general office, Dallas.

A. C. FARMER, city superintendent at Ft. Worth, Texas, is attending the National Rotary Convention in Atlantic City.

H. L. MORRIS, formerly assistant manager, has been appointed acting city superintendent at San Antonio, Texas.

D. C. CASON, manager at Little Rock, Ark., is taking a well-earned vacation.

W. A. PORTEUS, city superintendent at New Orleans, was recently elected president of the New Orleans Rotary Club. He is at present enjoying a much needed vacation with the Rotatarians at Atlantic City.

F. W. GRUELING has been made manager at Baton Rouge, La.

C. C. JOHNSON, vice-president, and Joseph Maxwell, general manager, of the American District Telegraph Company, New York, were visitors at the general manager's office in June.

R. W. WHITEHEAD, of Vice-President Yorke's office, was a Dallas visitor recently.

GEORGE LA BRYN, of the plant department, Chicago, visited the general offices recently.

L. W. WELLS, vice-president and general manager of the Texas Midland Railway, called on General Manager Mohr recently.

J. L. HENRITZY, superintendent of telegraph of Ft. Smith and Denver City R. R., was a visitor in Dallas recently.

S. E. STRAUS has been appointed district superintendent of the American District Telegraph Company, with headquarters in Dallas.

Western Union Meeting at Oklahoma City, Okla.

A meeting called by F. H. Austin, district commercial superintendent, was held in the Huckins Hotel, Oklahoma City, on Saturday and Sunday, June 19 and 20, for as many of the nearby third district managers as could arrange to attend.

The meeting was conducted by G. P. Brinkley, district commercial manager on the general manager's staff in charge of development work in the Gulf Division, who gave the managers detailed instructions on telegraph salesmanship, and provided them with arguments to enable them to overcome such objections to the increased use of the telegraph method of communication as are sometimes advanced by patrons.

There were two business sessions Saturday and one Sunday morning in addition to which there was a banquet at the Huckins Hotel on Saturday evening.

Mr. Austin presided as toastmaster at the banquet; two musical numbers were given by Miss Spicer; a reading was given by Miss Butler, and talks were made by O. J. Pickle, city superintendent, Oklahoma City; A. R. Lingafelt, former district commercial superintendent, Western Union Telegraph Company, Oklahoma City; W. H. Schroeder, special representative of Acting General Manager F. A. Mohr, of Dallas; G. P. Brinkley, district commercial manager, Dallas; W. T. Germany, chief operator, Oklahoma City; Mr. Burton, secretary, Western Union Employees' Association, Oklahoma City; E. E. Louderback, district commercial manager, Oklahoma City, and J. M. Delmar, district commercial manager, Little Rock, Ark.

In addition to those mentioned above, the following managers were present:

D. C. Cason, Little Rock, Ark.; F. Ragland, Chickasha, Okla.; L. E. Miller, Bartlesville, Okla.; Frank Martin, El Reno, Okla.; A. M. Williams, Miami, Okla.; J. F. J. Elliott, Muskogee, Okla.; J. Dimmick, Shawnee, Okla.; L. R. Corrin, Drumright, Okla.; N. Hosey, Henryetta, Okla.; W. D. James, Sapulpa, Okla.; Miss

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Keehn, Ponca City, Okla.; Miss Nina Hill, Blackwell, Okla.; Edna Maxey, Elk City, Okla.; Mrs. Ada McDaniel, Mangum, Okla.; Ina Mossman, Perry, Okla.; Miss W. Shafner, Sulphur, Okla.; Ruth English, Vinita, Okla.; Louise Clisby, Wagoner, Okla.; Miss Joynes, Lawton, Okla.; Miss Chadek, branch manager, Oklahoma City, Mrs. Cully, cashier; Mrs. Anderson, Mrs. Medley, Mrs. Lewis, Miss Lycan and Miss Crooks, receiving clerks, Oklahoma City, and Miss Thropshire, telephone supervisor, traffic department, Oklahoma City.

The meeting was the first commercial meeting held in Oklahoma City for several years and the managers of the various district offices not only had an opportunity to learn about modern methods of salesmanship as applied to the telegraph business, but also had a real opportunity to become personally acquainted with each other and with the newly appointed district officials.

Western Union, Pacific Division

M. T. Cook, general manager of the Pacific Division is reaping material benefits for the service in his personally directed campaign which has in view prompt delivery of telegrams received with incomplete or incorrect addresses. Under his guidance delivery clerks at offices in the Pacific Division are outdoing Sherlock Holmes in applying the science of deduction in unraveling hard cases. Improvement in this arm of the service has not only resulted in immediate delivery of telegrams which might excusably have been delayed, but hundreds of service messages asking for correct addresses have been rendered unnecessary, and when it is borne in mind that one service message means two, and that it costs as much to handle a service message as a paid message, it is evident that time and thought devoted to the subject is effort well invested. Employees in the Pacific Division whose achievements along this line have attracted the attention of officials at San Francisco and in New York are: Edward Cavallini, San Francisco; R. Rowse, Spokane, Wash.; Harry Jacobs, Seattle, Wash.; E. M. Holland, Miami, Arizona; Mrs. Van Sittert, Long Beach, Calif.; Mrs. Nihill, San Francisco, Calif.; E. E. J. Rowse, Spokane, Wash.; Leroy Hossack, Porterville, Calif.; Miss Gray, Santa Monica, Calif.; Mrs. Haskell, Bakersfield, Calif. Messengers Hamilton, of San Diego, Calif., and Hearin of Ellensburg, Wash., also made scores. Office managers who have effected deliveries after clerks had given doubtful addresses the once, or twice over, are: Baker, of Chico, Calif.; McCann, of Toppenish, Wash., and Blashfield, of Victoria.

F. H. AUSTIN

District Commercial Superintendent, Western Union Telegraph Co., Oklahoma City, Okla.

We present herewith a photographic likeness of F. H. Austin, district commercial superintendent of the Western Union Telegraph Company at Oklahoma City, Okla.

Mr. Austin has been in the service of the company continuously during the past nineteen years, serving in various capacities. At one time he was chief operator and district traffic supervisor at Mobile, Alabama, later working at Shreveport, La., and at San Antonio, Tex., as manager, and then for a time assistant manager at New Orleans, La.

In recent years Mr. Austin has been a member of the staff of the general manager of the Gulf Division at Dallas, Texas, serving as district commercial manager and as assistant to the general manager. His recent promotion to the post of district commercial superintendent brings to that office a man still young in years, but who has had wide experience in all branches of the telegraph service. Throughout the South and Southwest Mr. Austin is popular with business interests and is thoroughly conversant with the commercial enterprises and requirements in that vast territory.

F. H. Austin

As noted in our July 1 issue, the traffic load of the Oklahoma City office has increased 32 per cent. over the same period in 1919, and in the other offices in that district the gain has been even greater. To properly care for this continually increasing telegraph traffic calls for the exercise of just such business qualifications as are possessed by men of Mr. Austin's personality and experience.

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The Proposed British Imperial Wireless Chain

The scheme, interrupted by the late war, of inalling an all-British chain of radio telegraph staons connecting up the various parts of the British mpire, is likely to see fruition in the near future. Last November an Imperial Wireless Committee as appointed with the approval of the cabinet, mprising representatives of the Postoffice Departent, the Admiralty, and the National Physical aboratory, as well as outside experts. The war fice presented to the committee a scheme calling r the construction of twenty-two main radio staons and twenty-three subsidiary stations, the total pital cost of which would be many millions of llars.

The committee's report, which has just been subitted, recommends that the Empire be linked up itelessly by stages of about 2,000 miles each, and at the system employed should be that employing ermionic valves, both for transmission and reption.

The scheme contemplates two main chains of imerial wireless, one receiving Africa and the other sia and Australasia, both with Cairo as their first ation. For the first link of the first chain use ould be made of connection on the Poulsen arc stem between Oxford and Cairo, which the post fice has nearly completed. All the rest of the staons would employ the thermionic valve system.

The cost of the scheme is estimated at £1,243,000 and it is figured that there would be a loss of about £100,000 annually in the working of the system during the opening years.

The view taken by the committee is that these interimperial wireless chains should be built and run by the State while long distance wireless communication with foreign countries should be left to company enterprise, thus affording the possibility of healthful competition between the two.

The report indicates that the annual charges, including salaries and maintenance costs would amount to about £7,500,000.

The appearance of the committee's report has stirred up considerable discussion in government and commercial circles, chiefly around the question whether the government should erect and operate the stations or turn the job over to the existing major commercial radio organization—the Marconi Company.

It appears the Marconi Company put forward a scheme under which the company stated its preparedness to erect for its own account and at its own cost a complete chain of radio stations throughout the whole Empire, which, the company's directors believed, would serve all reasonable purposes of a government owned and operated service. With private ownership and operation of the stations not only would the government have no financing to arrange, but the commercial company agreed to turn over to the government 25 per cent. of the profits derived from the service, after making due provision for interest, amortization, etc.

Various interests in Great Britain have grave misgivings at the idea of placing the wireless chain in the hands of government departments. These interests are patriotic, conservative and powerful, and it is likely that before a decision is made one way or the other all phases of the subject will be threshed out in the open.

The best card the State ownership advocates have is the satisfactory operation of the Pacific cable, controlled by the Pacific Cable Board. In the case of the Pacific cable, however, at the time it was laid no private company was willing to undertake the work.

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PRINTING TELEGRAPH SYSTEMS

Remarks on J. H Bell's Paper Which Appeared in Telegraph and Telephone Age in five semi-monthly instalments beginning April 16, 1920.

By STANLEY RHOADS, New York

In Mr. Bell's paper, the references to the Murray system are not entirely clear. In the early part of the paper it would have kept matters straight if reference had been made identifying the Murray invention and the Multiplex system in use in this country. It was necessary to carefully go through the entire paper in order to make certain that the Murray automatic high speed system is different from the Murray multiplex system.

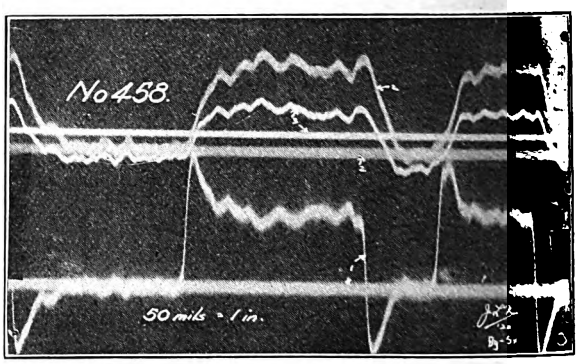
Mr. Bell states that he has no data regarding actual speeds of transmission over aerial lines of varying lengths. Recently, in the laboratories of the New York Central Lines some oscillograms were made by John L. Neisse, telegraph and telephone engineer of the C., C., C. and St. L. Railroad, at Indianapolis, Ind., which may throw light on this subject.

It is the writer's understanding that at the present time the Western Union Telegraph Company is using printers chiefly on single copper wires; the circuits duplexed and operated differentially. It is the experience on the New York Central Lines that this differential operation causes considerable induction in adjacent circuits, in some cases interfering to a serious extent with the operation of telephone circuits carried on the same pole lines. The increasing number of printer multiplex circuits operated increases the disturbances.

Bridge duplexes do not seem to cause appreciable difficulty of this nature, but the speed of operation of the Bridge sets may not be as high as with differential working. Certain tests have shown that the differential system is satisfactory from an induction standpoint on paralleling telephone circuits when used on composited wires, that is, on the Morse legs of two pairs, making up a phantom of which each pair gives one Morse circuit; also on Morse circuits made up of each of two wires which form a long distance telephone pair. It is the intention, therefore, to use the differential system on composited wires and the Bridge system on simplex and single wires, on the New York Central Lines. However, it is apparent from some oscillograms taken that Bridge sets can be speeded up when used on composited circuits by removing the condensers and coils in the Morse legs of the composite sets, but because the efficiency of the differential is higher and the polar relay in it gets more current at lesser operating voltages it seems preferable to use differential on composited circuits. The lessened voltage results in lessened disturbance in the telephone branch of the circuit.

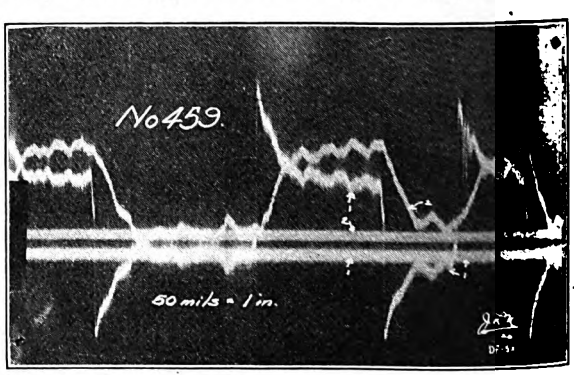
It should be the "order of the day" to be cautious in planning circuits for extensions of printer equipment; for, unless the effects of induction are duly anticipated it is but a question of time until the speed of operation of circuits equipped with printers will be arbitrarily limited to that possible with Bridge working.

The anti-noise set as used in printer circuits is



understood to modify the differential wave so tha it resembles the wave of a Bridge duplex.

Oscillograms 458 and 459 show the outgoing an incoming waves on a circuit made up of a 280-mil loop of simplexed telephone lines equipped wit Western Electric Company straight step-up selec tors, consisting of two so-called "high resistance



simplexes—one 140-mile No. 8 B. W. G. iron pai and the other 140-mile No. 9 B. & S. copper pair- both connected together with repeaters at the jun tion point. That is, the circuit was arranged wi two duplex sets at Indianapolis, Ind., and is co nected to two simplexes to Springfield, Ohio, whe the simplexes were tied together without repeate This permitted simultaneously recording both ou

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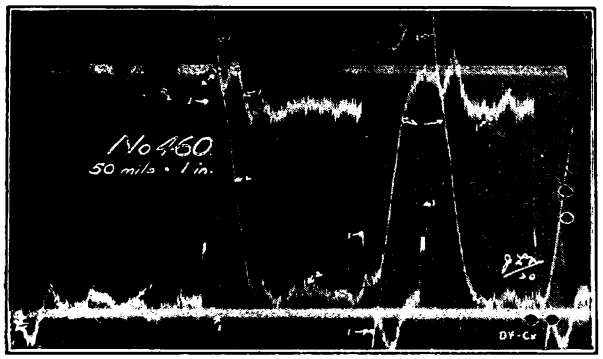
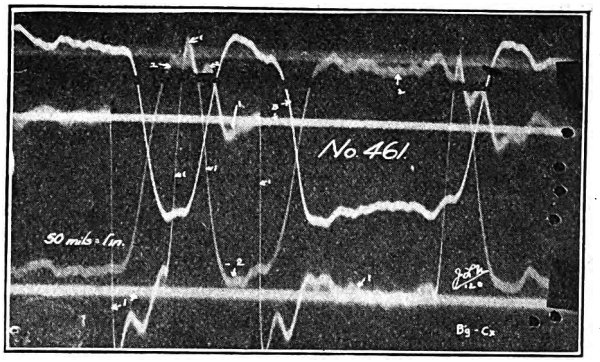
going and incoming waves at Indianapolis. The sharpness of the differential waves in trace No. 1, of 459 is noticeable, compared with the more rounded wave of trace No. 1 of 458, which is the





Bridge duplex. The duplex sets used were standard Western Union instruments, installed per that company's specifications. The simplex coils were Western Electric Company No. 46-A with No. 34-B non-inductive resistances added between the No. 46-A coil and the line.

Oscillograms 460 and 461, similarly, show a comparison of Bridge and differential duplex working on a 280-mile loop of two telephone lines equipped wtih Western Electric Company alternating current selectors consisting of two "low resistance" simplexes—both No. 9 B. & S. copper pairs. This loop had standard composite equipment at Indianapolis, as shown in the left half of Figure 1, with a duplex set connected in the Morse leg of each of the two composited sets. The circuits were tied together at Bellefontaine, Ohio, with low resistance simplex coils, but with the composite apparatus disconnected at points a and b of Figure 1, and these points connected temporarily.

Trace No. 1 of 460 is the outgoing wave; trace No. 2 is the incoming wave—differential operation.

In oscillogram 461, trace No. 1 is the outgoing wave and No. 2 the incoming wave. The benefit of the low resistance of the simplex coils of No. 460 and No. 461, as compared to No. 458 and No. 459 is readily apparent. The voltage was 160 on all four tests. The outgoing wave is always easily

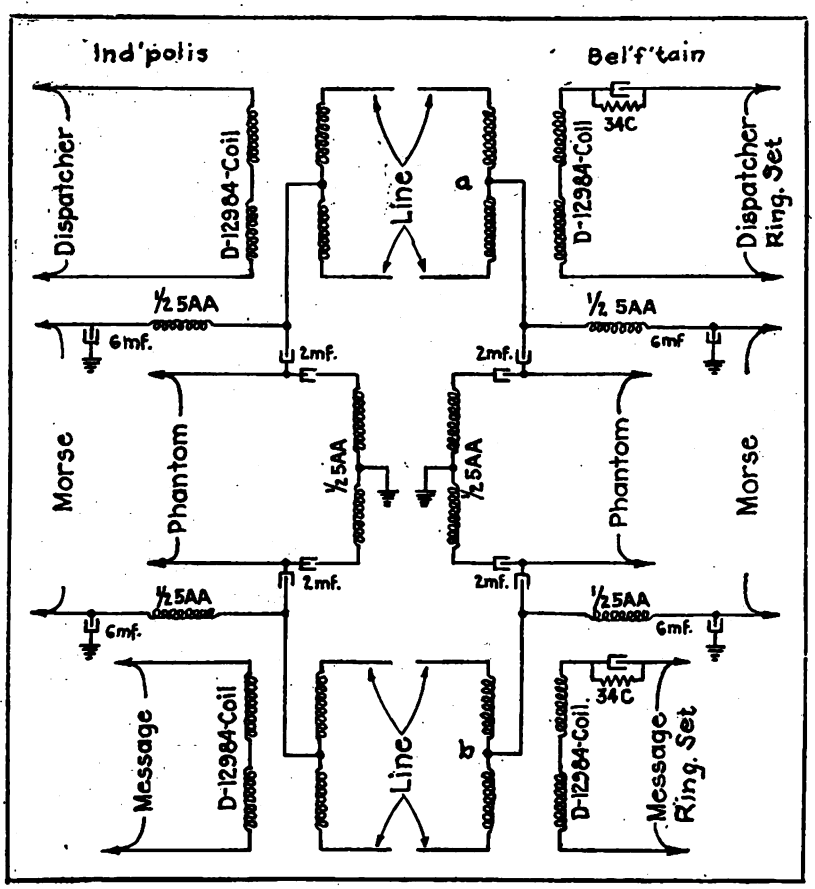


FIG. 1

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identified by the peak at the beginning of each reversal, which is due to the line charging current.

These oscillograms were taken with the recording drum revolved at the uniform rate of ten inches of film per second. The only cable in the circuits tested consists of about 1,000 feet of No. 16 gage paper insulated, at each end of each circuit.

From these records it would appear that the reversals may be at the rate of ten to fifteen cycles—fifteen positive and fifteen negative impulses per second for the average simplex circuit of from 250 to 300 miles in length.

The tests referred to disclosed that the speed does not change appreciably with variations in the type of circuits used. When a low resistance circuit is used it is customary to employ correspondingly lower potentials, which is desirable from the line insulation standpoint. Wet weather does not reduce the margin of operation as much when the voltage is low as when it is high. It may be observed, however, that by increasing the voltage, and as a consequence the strength of the line current, the reversals may be made more rapidly without loss in firmness of registration of the polar relay armature.

An interesting point is discernible by comparison of the four above mentioned oscillograms. The incoming wave is the same shape in both the Bridge and differential test when used in the same circuit. The incoming wave of No. 450 is similar to that of No. 459, and that of No. 460 is similar to that of No. 461.

Mr. Bell gives an interesting illustration of the advantage of duplex over single line working and shows with the aid of current wave traces that the weakening of the current by line leakage has less effect in a line operated polar duplex. Certain oscillograms taken at Indianapolis also show very clearly that this advantage exists.

In one examination an attempt was made to determine whether or not wide variations in the current strength in the polar relay would noticeably alter the character of signals transferred to the reading sounder, while maintaining constant the speed and duration of "dots" in the sending device. Variations from ten to thirty milliamperes indicated that it takes a sounder about the same time to act in both cases. Likewise it takes the sounder about the same time to release after the sending key is opened. So far as oscillograms show the condition it would appear that it requires the same time to reverse the magnetism in the relay, to operating values, when ten milliamperes flow as when thirty milliamperes flow.

Mr. Bell, in a paper presented before a meeting of the Railroad Telegraph Superintendents' Association, in 1915, submitted data on this subject which is interesting in connection with the foregoing. Charts presented showed that the time required in the operation of polar relays is measurable. In one diagram it was shown that a relay adjusted for .004 inch travel, with ten milliamperes current required .0100 second, and at 30 milliamperes required .008 second, a difference of but .002 second. At fifteen impulses per second, the length of a dot—assuming dot and space equal—is .030 second. At ten dots per second the length of a dot is .050 second, on which a difference of .002 second is but four per cent.; too slight to be noted by ear at either speed of dots.

Now that the commercial telegraph companies and the telegraph departments of the trunk railroads are giving attention to the problems of transmission it is to be hoped that from time to time we shall have published accounts of results obtained.

American Telephone and Telegraph Company Earnings for Past Six Months

Earnings of the American Telephone and Telegraph Company for the first half of the present year were well in excess of the company's customary 8 per cent. dividend rate, according to the statement for the six months ended June 30 issued by H. B. Thayer, president.

The surplus after charges and Federal taxes was $26,328,663, equivalent to $5.95 a share earned on the $441,981,200 capital stock. No comparison was available with the corresponding period of last year, as the lines were under Federal control at that time, but for the six months ended June 30, 1917, the period just prior to government control, the balance after dividends was $3,756,100, as compared with $8,646,320 for the six months period just closed. Regarding business conditions, Mr. Thayer said in his announcement:

"The company has recently received in full from the United States Treasury the balance due the Bell System for operations under Federal control, in accordance with the settlement set forth in the annual report.

"Adjustment to conditions arising from and following the war is proceeding more rapidly than we would have dared to hope.

"Since January 1 the Bell System has already added over 308,000 stations. This is a new high record, and in addition there are over 200,000 unfilled orders for station installations in excess of normal. These stations are being installed as rapidly as possible in view of the present difficulties of production and transportation. Provided materials can be obtained and installed, present indications are that this year will show the greatest growth in business in the history of the Bell System."

Two Additional Patents have been granted to Thomas B. Dixon, covering systems and apparatus for submarine telegraphy. The United States numbers are 1,339,549 and 1,339,551.

The Old Wire Chief says: "Sobriety now is unavoidable. In the past year I have not succeeded in selecting for cultivation a new virtue that would bring to me so much credit as I used to get for being a sober man."

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Multiplex Telephony and Telegraphy Over Open-Circuit Bare Wires Laid in the Earth or Sea.

By Major General George O. Squier,
Chief Signal Officer, United States Army.

(*Concluded from July 16 issue*)

An investigation was then made with a search coil circuit consisting of a small loop tuned by a variable condenser and an electron tube detector and two-stage amplifier. By moving this coil along the line the loops and nodes of the standing waves were located. The wave-length used in these tests was 250 metres, and the transmitting current about 120 milliamperes.

Bare Wires Buried in the Earth

Experiments were also made at Little Silver, New Jersey, connecting two stations by a bare wire buried in the earth at a depth of about eight inches (20 cm.). A furrow was plowed between the two stations and a bare No. 16 wire was then laid in this furrow; a second furrow was plowed back along the side of the first one, so that the earth from the second furrow was turned back into the first, covering the wire. The soil is moist, sandy loam, being only a few feet above tidewater. Signal Corps SCR-67 radio sets were used for transmitting and receiving purposes, one connected at each end of the buried wire. With this arrangement telephone and telegraph communication was established over a distance of about a half mile (0.8 km.). In general at the frequencies used the line behaved as an inductance.

In the case of the propagation of high frequency currents over bare wires laid on the surface of the earth or buried in the earth, the electromagnetic energy associated with it is apparently confined only to a limited region surrounding the wire. If a bare wire, open at the receiving end, whether laid on the surface of the earth or buried in the earth, were considered as a radio atennae, it would be expected that signals would be heard in a region along the prolongation of the wire in a direction opposite to the open end, in accordance with the well-known phenomena relating to directive antennae. As a matter of fact, however, the experiments showed just the reverse. Signals were always located in close proximity to the wire itself, and followed it about through angles or in straight lines as the wire was laid.

Another remarkable effect observed in connection with the experiments on the propagation of high frequency currents over buried wires was the influence of a comparatively thin layer of soil in screening the electromagnetic effects due to the current flow in the wire. The following experiment was made: Signals were transmitted over the bare buried wire, and an exploring coil, with a suitable detecting instrument, was moved along the buried wire at a fixed distance from it. It was found that by uncovering a short length, say 5 feet (1.5 m.), of the wire immediately beneath the coil the signals would appear, and would disappear again when the earth was put back over the wire. From a military standpoint this screening effect of comparatively thin layers of certain kinds of soil is evidently very important. It serves to separate and isolate certain radio phenomena on bare wires in earth to secure secrecy which is so necessary for military purposes, and so difficult and well-nigh impossible to obtain in the air.

Multiplexing

No special mention has been made of the multiplex features in connection with these open circuit lines, whether buried in earth or water. It is self-evident that the general principles of multiplexing over wires in air by using radio frequency carriers are also applicable to wires in earth or water.

Bureau of Standards Experiments

A detailed laboratory study of the phenomena connected with the propagation of high frequency currents on bare wires submerged in fresh water is also being conducted in the Signal Corps research laboratory at the Bureau of Standards. The object of these researches is to determine the electrical constants of bare wire submerged in water when subjected to high frequency currents. A suitable tank for this purpose was available at the Bureau, the dimensions of which are as follows: 125 metres long, 2 metres deep and 2 metres wide. Two wires were placed in the tank, serving as a to-and-fro conductor, and constituting a complete transmission line immersed in water. An electron tube oscillator was used as a transmitter and measurements were made to determine the apparent impedance of the system with the remote end short-circuited and also open-circuited. From these measurements the electrical constants of the line were calculated. The research has not been completed yet, but the information obtained in regard to the capacity and leakance may be of considerable interest, and are accordingly given here in the accompanying curves, Figs. 9 and 10. It is seen that at low frequencies the capacity is extremely large, about 1200 microfarads per kilometre, the equivalent of an entire Atlantic cable, but diminishes very rapidly as the frequency is increased, and at a frequency of about 40,000 cycles a second, the capacity practically vanishes. The leakance increases with the frequency up to about 5000, and then begins to slowly decrease as the frequency is increased. Experiments are now being conducted at still higher frequencies.

The results were surprising, particularly the high

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capacity values at the low frequencies. The experiments apparently show that the frequency of the current used has a marked influence on the behavior of water as a medium, and is entirely different from what it would be for direct or low frequency current.

It must be noted, however, that in the calculation of the values given, the usual transmission formulae were employed, which may not be applicable in this case. It is expected, however, that further experiments will be made under resonance conditions, and at still higher frequencies.

Resonance Wave Coils

In the investigation of the problems discussed in the preceding sections, open circuits were used and the electron tube employed as a potentially operated device, the grid being directly connected to the line. To get the best results, it was necessary to devise a method for securing high potential points at the receiving end of the line without losing the advantage of tuning. This was accomplished by the use of a resonance wave coil connected to the line, and adjustment obtained by either moving along the coil the end of the wire connected to the grid, or sliding along the coil, a narrow metal ring connected to the grid, this constituting a capacity coupling between the grid terminal and the coil. Coils of various dimensions were made up of wave-length ranges from 250 metres to 1800 metres. A separate study of the electrical characteristics of these coils as a means for receiving radio signals is being conducted in the Signal Corps laboratories.

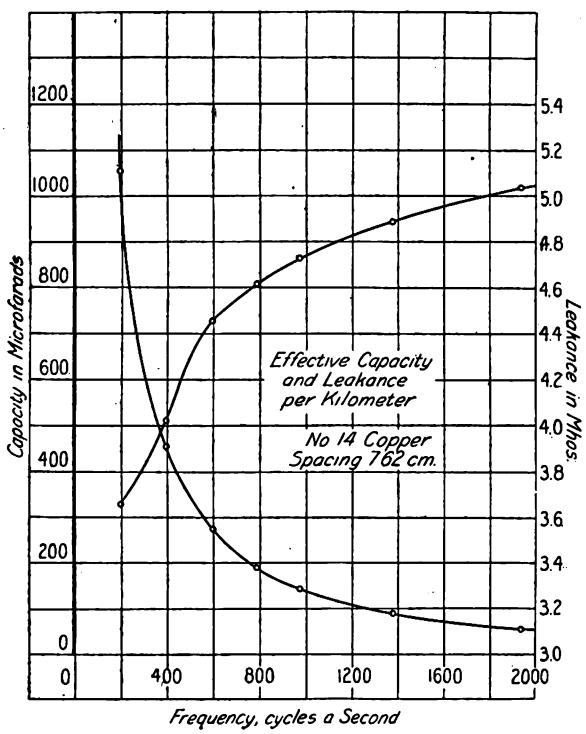

Fig. 9

For the present purpose it will suffice to give here only a general statement in regard to the characteristics of the resonance wave coil receivers and the results obtained. The coils were made up in the form of long helices uniformly wound with very fine wire so as to give uniformly distributed inductance, capacity and resistance, except for the disturbing end-effect. The inductance per unit length is high and, therefore, in a comparatively short coil, the equivalent condition of a long line is obtained in the matter of wave development. As an illustration we may give the data for one coil as follows: Diameter, 11.5 cm.; length, 58 cm.; number of turns per cm., 34; total inductance of coil calculated, 80.5 millihenrys; fundamental wave-length measured, 1700 metres. Such a coil connected to an antennae or bare wire in water or earth, as in these experiments, can be used for tuning and at the same time advantage can be taken of the wave development on the coil, and the highest potential point used for obtaining the greatest sensitiveness in the receiving of the signals. This is practically the way in which the wave coils were used in the experiments described above.

Aside, however, from its use as a tuning element in connection with antennae or lines, it was found in the course of the experiments that a resonance wave coil can also function as the antennae, so that by itself it constitutes a complete antennae system. The coil may be grounded at one end or it may be entirely free. In either form it can be utilized as a means for receiving radio signals.

It may be noted that in an antennae of this kind all the electrical constants, inductance, capacity, resistance and the e.m.f. induced in it by the incoming signal are of a distributed character, which makes it in a sense an ideal wave conductor.

No complete data is yet available in regard to sensitiveness and selectivity of the wave coil antennae as contrasted with the usual forms of closed circuits now used. Very promising results, however, are being obtained in the Signal Corps laboratories and the study of the electrical characteristics of the wave coil is being continued.

Direction Finding

The experiments with the resonance wave coils led to the discovery that it possesses remarkable directive properties. A change in the position of the coil with respect to the transmitting source changes the voltage and current distribution on the coil and accordingly produces a shift in the position of the point of maximum potential. The shift occurs in one direction or the other, depending on the position of the transmitting source with respect to the coil. Hence, this offers a means of determining not only the plane in which the electromagnetic waves travel, as is the case of the usual loop antennae, but it determines the actual direction from which the signals proceed. The explanation appears to be as follows:

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If the electromagnetic wave front is parallel to the axis of the coil, as indicated diagrammatically in Fig. 11, each element of the coil has induced in it an e.m.f. of the same intensity and the same phase. We have a condition of a conductor of uniformly distributed electrical constants, and acted upon by uniformly distributed e.m.f., from which results a definite potential and current wave distribution on the coil, the exact form depending on the length of the coil, frequency, and terminal conditions. By moving the terminal of the grid of an electron tube along the coil, the point of maximum

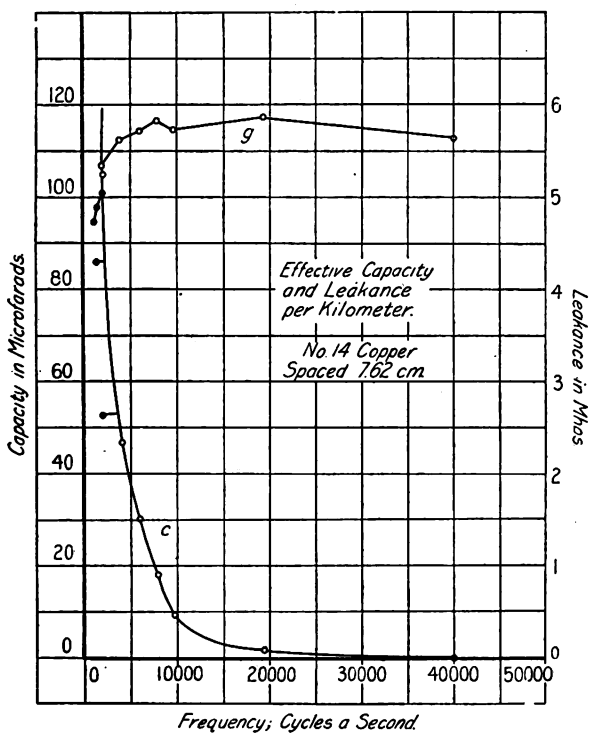

FIG. 10

potential is readily determined. The connection between the grid and the coil need not be an actual physical contact. In most experiments a capacity connection was used, consisting of a narrow metal ring sliding freely on the coil. If now the coil is turned at some angle, as shown in Fig. 12, the e.m.f. induced in the coil is no longer uniformly distributed, since there is a difference of phase between the e.m.f. acting on each element of the coil arising from the difference in time required for the electromagnetic wave to reach the different parts of the coil. As a result, the voltage and current distribution on the coil is altered and the point of the maximum potential loop is accordingly shifted in one direction or another, depending on the direction of inclination of the coil to the direction of propagation of the signal. It was also found that when the longitudinal axis of the coil is perpendicular to the direction of propagation of the signals two potential loops may occur, one near each end of the coil, these potential loops being substantially of the same amplitude. When the coil is turned through an angle in the horizontal plane the potential loop near that end of the coil which points in the general direction towards the transmitting source is of a greater amplitude than that of the loop near the end of the coil pointing away from the station. This, therefore, offers a suitable means for determining the actual direction from which the signals proceed.

The above is only a brief statement of the general principles governing the operation of resonance wave coils as applied to direction finding.

SUMMARY

For military reasons, if for no other, as stated in the introduction of this paper, the Signal Corps has recently undertaken certain investigations in the phenomena connected with the transmission of high frequency electromagnetic waves over bare wires in earth and in water.

In attacking the problem from various angles and in carrying out these investigations the research staff of the Signal Corps laboratory at Camp Alfred Vail, Little Silver, New Jersey, was directed to carry out experiments on bare wires laid on the surface of moist ground and also buried in earth. The staff at the Signal Corps research laboratory at the Bureau of Standards was directed to investigate fundamentally the transmission of electromagnetic waves over bare wires in fresh water. In addition to this, the engineering staff of the office of the Chief Signal Officer has carried out from time to time certain experiments of a more or less crucial character which have come up for solution in the prosecution of this work at the other laboratories.

Certain data from each of these groups of engineers have been presented above. The phenomenon associated with the transmission of high frequency waves over bare wires in earth or water are obscure and complex and the writer has formulated no definite theory at the present time.

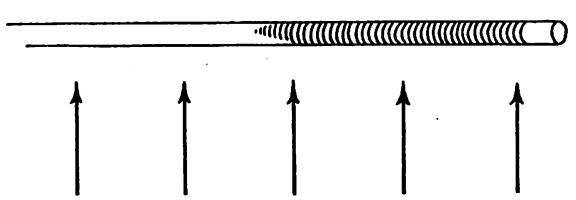

FIG. 11

RESULTS OBTAINED

1. Telephone and telegraph communication has been established between Fort Washington, Maryland, and Fort Hunt, Virginia, across the Potomac River, below the City of Washington, over a distance of about three-quarters of a mile (1.20 km.), by the use of a bare No. 12 phosphor-bronze wire laid in the water to connect the stations. The trans-

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mitter consisted of an electron tube oscillator which delivered a current of about 270 milliamperes to the line at a frequency of about 300,000 cycles a second. At the receiving end of the line an electron tube and a six-stage amplifier were used without any ground connection. With this arrangement good tuning was obtained at both ends of the line, and telegraphic and telephonic transmission secured over the bare wires immersed in fresh water.

2. A resonance wave coil has been developed. The coil is in the form of a long helix wound with a large number of turns on which stationary waves are produced by the incoming radio signals. An electron tube is used as the detector, the grid being connected to the point of maximum potential on the coil. The wave coil may be used either as a part of the usual antennae system or a part of a

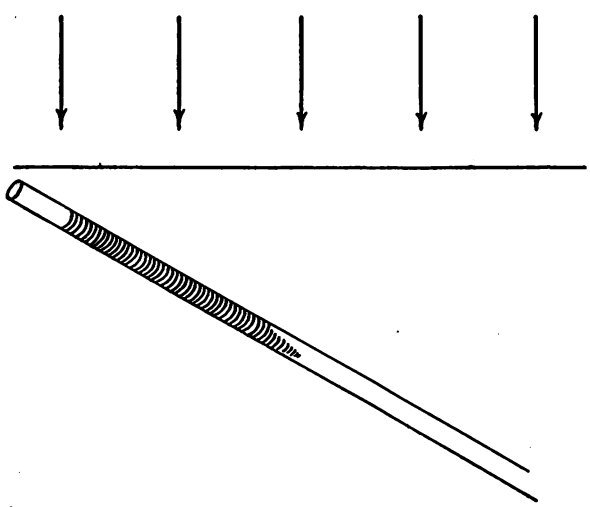

FIG. 12

line wire, or it may act itself as the antennae for picking up the energy of the signals. In the latter case the coil may be either free at both ends or grounded at one end. Good results have been obtained in either case. It has been found also that the open coil has directional properties and can be used as a goniometer. This form of radio goniometer has the great advantage that it permits not only of determining the plane where the signals are strongest but also the direction from which such signals proceed.

3. Telegraph and telephone communication has been also established between two stations at the Signal Corps research laboratories at Camp Alfred Vail, Little Silver, New Jersey, using a bare No. 16 copper wire buried in the earth to a depth of about eight inches (20 cm.) to connect the stations. The distance between the two stations was three-quarters of a mile (1.20 km.). Frequencies as high as one million cycles a second were used. Similar communication has been carried on over a bare wire one and three-quarters mile (2.8 km.) long laid on the surface of moist earth. The current at the transmitting station in these installations was about 100 milliamperes. It has been shown that a bare wire buried in moist earth with the distant end open can be tuned both at the transmitting end and at the receiving end.

SUGGESTIONS

1. In the older art of ocean telegraphy, the elaborateness of line construction has already reached a practical limit. The best Atlantic cable of the present day is limited in operation to electric waves of frequency of the order of 10 cycles a second. The electrical construction is such as to limit the voltage employed on any long cable to from 50 to 80. The relative values of the line constants in any present ocean cable preclude the possibility of ocean telephony.

The most promising hope of improving the line construction for ocean cables is believed to be to abandon the present method of design and construction and to start with the simple case of bare wires in water using high frequency currents and study the necessary changes to produce optimum transmission.

The use of a high frequency "carrier" has the inherent advantage that the distortion phenomena accompanying present methods of long-distance transmission are eliminated, and we are principally concerned with the problem of reducing attenuation. The most suitable voltage may be employed and present multiplex methods may be utilized. The electron tube is available for both the generation and the reception of the waves.

2. During the last few years an intensive study has been made of the surface conditions of wires necessary to produce the emission of electrons, and to this intensive study, both by universities and industrial research laboratories, is due the high state of efficiency of the present electron tube. Nothing short of a similar study of the surface conditions of wires to prevent the emission of electrons instead of producing them, will finally give us the wire conductor of the future.

3. The development of types of resonance wave coils, both open at one end and at both ends, for general radio work offers an interesting field for investigation. This involves the study of the electron tube as a potentially operated device. The application of such coils properly designed for specific purposes may lead to the practical solution of a number of radio problems such as directional effects, and wave coils antennae of very small dimensions.

4. The account of the experiments thus far conducted and the reasons which have led to the undertaking of these experiments on the part of the Signal Corps, are presented to the National Academy of Sciences at this time in conformity with the new spirit of organization for national and international research so admirably typified by the National Research Council which is under the general direction of this official body.

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NEW YORK RADIO CENTRAL STATION

DESCRIPTION OF A SUPER-POWERED RADIO STATION TO BE ERECTED BY THE RADIO CORPORATION OF AMERICA

For more than two decades the wonders of wireless have so unceasingly intrigued the public imagination that it would appear little remained to be accomplished in developments of revolutionary character. Yet, once again, it is disclosed that a startling conception in wireless communication has been quietly brought to a point of realization. On the north shore of Long Island, near New York, the Radio Corporation of America is about to begin construction of a super-powered radio station that will simultaneously send to and receive messages from five great nations of other continents.

The bare announcement presages a new era in commercial radio communication. It is one conceived in the convention-defying spirit which, coupled with engineering skill, has brought about the expansion of wireless to its present status as a world-wide public utility. Instantly obvious is the fact that the plan will result in the contribution of an important means of breaking down America's isolation from the peoples of certain other continents and open up new visions of communication possibilities.

The new and great medium of far-reaching economic and political influence will bear the name of "New York Radio Central Station," the steel towers of which will arise on a 6,400-acre tract, comprising nearly ten square miles of land lying east of Port Jefferson, with a long frontage on Long Island Sound. The preliminary engineering studies have been completed, contracts for all the construction materials are being let, and a force of radio experts, after months of preparation, will immediately take the big job in hand.

A definite idea of the ultra-modern character of this radio plant may be gained from the observation by Edward J. Nally, president of the Radio Corporation of America, under whose direction the world-wide wireless system has emerged from an idea into a reality. "Everyone at all familiar with wireless," said Mr. Nally, " knows that at Nauen, Germany, and Bordeaux, France, are two of the largest stations in the world. Up to now they have been viewed with admiration; consider, then, the tremendous advance represented in this latest step; the New York Radio Central Station in the aggregate, will be five times more powerful than either of these."

He explained that there will be five complete transmitters, each one a duplex unit with a corresponding receiving station located nearby. All five transmitters and the five receivers will operate simultaneously and will transmit and receive messages over thousands of miles continuously during day and night.

"New York will be the direct focal point of the world's intelligence in an entirely new sense under this communication scheme," he continued. "As soon as the station is completed immediate message service will be established with France and Germany to supplement the existing commercial circuits; ultimately, radio from this station will connect up Buenos Aires and other points in South America, and ether-wave messages will be flashing to and from Poland, Sweden, Denmark and other European countries. Like the ripples that race in circles over a pond when a stone is dropped in the water, the electromagnetic waves from this station will soon encompass practically the whole of the civilized globe. It is a plant that dwarfs all existing wireless stations into insignificance; a single unit will have power and range the equivalent of the largest wireless stations in the world today."

The form of aerial construction, too, is wholly a new departure. From the central power house six spans of aerial wire will radiate out in a star pattern, to a distance of more than one mile from the center. The wires of this huge antenna will be supported on self-supporting steel towers, each 400 feet in height, with the wires suspended at the top between 150-foot cross arms. Each of the six antennae will have twelve towers, forming, so to speak, the spokes of a giant wheel fashioned out of seventy-two miniature replicas of the famous Eiffel Tower in France. Five of these antennae spokes will be used for regular service while the sixth is reserved for emergency operation.

Far more impressive than physical appearance, however, will be the things the eye cannot compass. Appreciate, that in the wires forming each spoke of the gigantic wheel there will be generated a power equal to the greatest present-day transoceanic wireless stations; then consider the fact that all five of these powers can, if desired, be combined into one, for signaling. A telegraphic signal created out of such tremendous electromagnetic energy could encircle the entire globe!

The apparatus and system which will be installed for each of the five units will be the same as that at present in the company's New Brunswick (N. J.) station, from which the voice of Secretary of the Navy Daniels was carried to President Wilson when he was at sea aboard the U. S. S. George Washington. In a number of experimental tests the voice has been carried by this radio telephone over distances of 2,500 miles with complete success.

Every exacting requirement of commercial radio message service will be satisfied fully in the apparatus and system of circuits with which the great station will be equipped. The generation of the energy required to span thousands of miles will be

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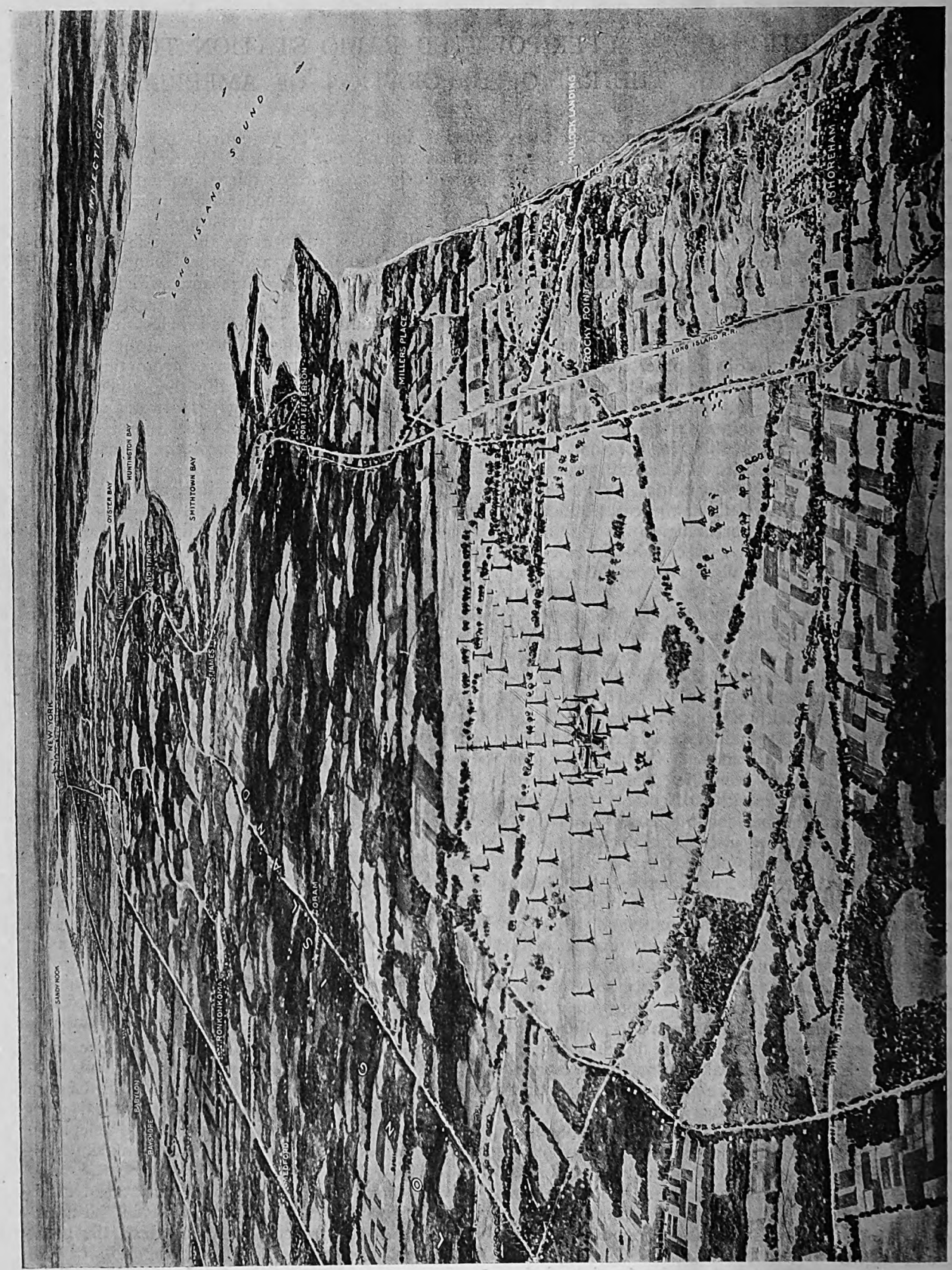

NEW YORK RADIO CENTRAL STATION.

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effected by Alexanderson alternators, which have made it possible to carry radio signals through space by continuous wave trains, instead of by the interrupted or discontinuous waves, generated by systems using the old-time "spark discharge" apparatus. Taken by itself, the Alexanderson alternator is an achievement rivaling the design of the new world-wide station. This machine is the concrete expression of an ideal which electrical engineers have held for many years, for it represents a perfected generator of high frequency electrical oscillations constructed along the lines of the ordinary power house dynamo. The problems solved by Mr. Alexanderson, chief engineer of the Radio Corporation, were thought insurmountable. Because the transmission of radio signals requires alternating currents of frequencies a thousand times or more in excess of those used in power engineering, it was considered beyond the range of practicability to obtain such currents from a dynamo. In the Alexanderson alternator equipment, the new station will have a source of energy proven as reliable as the power dynamo, yet creating a steady stream of electromagnetic oscillations, which will permit telegraphic signaling at high speeds. So efficient and reliable has the Alexanderson 200-kilowatt alternator installed at New Brunswick proven itself, that leading radio experts of Europe have made special trips of investigation to the United States to view its performance; now this already famous single machine is to be duplicated and installed in the New York Radio Central Station; but this time there will be two 200-kilowatt machines for each transmitting station—ten in all. The achievement, from a radio engineering standpoint, has nothing approaching a parallel; ten alternators, 2,000 kilowatts, 3,000 horse power—an astounding force to concentrate in realization of a dream to transmit messages over the world to all points of the compass from a single source!

Mr. Nally emphasized another forward step in engineering which will be incorporated in the super station. "We will utilize what is termed a multiple tuned antenna, which," he explained, "materially reduces the wasteful electrical resistance of the long, low, flat-top aerials formerly used. A great saving in power is thus effected; in fact, for the same power input formerly used for a single station, six times the effectiveness at a given distance is obtained. In other words, we obtain with this antenna, the same effect at a distance with 200 kilowatts input, as would be obtained from the old type of antenna with 1,200 kilowatts input! This new type of antenna is the equivalent of six independent radiators, all operating in unison at the same wave length, and for the complete station with its five antennae units, the power required will be less than 20 per cent. of that formerly necessary. The project, however, contemplates additional possibilities. To illustrate: We may, in many cases, utilize but one-half of a single spoke of the antenna system for communication service to a certain point. On this basis, the Long Island Station will ultimately permit simultaneous transmissions to a maximum number of ten points in the world, thus doubling the communication facilities originally planned.

"The receiving aerials are of a new type, too; they have been designed for operation with the Weagant system of 'static' elimination, which, by a combination of opposed electrical circuits, nullifies the long-dreaded effects of atmospheric electricity and makes possible uninterrupted reception from foreign countries under all weather conditions. We break away from precedent once again, in locating our receiving units only eighteen miles from the multiplex transmitting equipment, instead of following the former practice of establishing one transmitter and one receiver in one locality and restricting the service of the circuit to one overseas destination."

The arrangements for distant control of the New York Radio Central Station follow the same policy of concentration. In Broad Street, the heart of New York's financial district, the company's public telegraph office is being re-equipped to handle the new station's messages along with the Marconigrams which are now received for England, Norway, Hawaii and Japan. Thus messages for any of the five additional countries reached by the new station will be received in the New York City office and dispatched direct from a series of operators' keys and relays which will operate the powerful transmitting circuits located miles away on Long Island. Messages from over the ocean will ultimately be received in the same manner, receipt and delivery of the actual messages being effected by the customary messenger boy service direct to the home or office of the user of the trans-oceanic wireless.

It is expected eventually to install apparatus for high speed transmission and reception, which will be under the supervision of a trained staff of operators, along with which there will be the usual staff of expert Morse operators, who will work those circuits over which high speed transmission is not taking place.

Countless details of great technical interest and engineering importance are embraced in the specifications for the station, prepared by combining the personnel of the Radio Corporation and the General Electric Company, an arrangement made possible by the recent merger effected by these interests and the absorption of the Marconi Wireless Company of America.

GEORGE F. THODE, aged 78 years, a United States military telegrapher during the Civil War, died at Blakesburg, Ia., on July 15. He was a brother of John T. Thode, who was a member of the same corps during the Civil War and who saw active service in Tennessee. Besides his brother, Mr. Thode is survived by his wife and daughter.

J. J. LANE, a well-known old-time telegrapher, died at Summit, N. J., on July 5.

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New Metropolitan Tandem Board

On April 17, 1920, the first mechanical switchboard in Greater New York was cut into service. It is the first mechanical tandem board of its kind, not only in the New York Telephone Company's territory, but in the world.

The opening of this central office, known as the Metropolitan Tandem Board, marks the first step toward adoption of the machine-switching type of switchboards.

The Metropolitan Tandem Board is designed to handle traffic heretofore taken care of by the Jersey, Long Island and Westchester Toll Tandem Board, calls being passed to the Metropolitan Board, and trunks being assigned in the same manner as at the other tandem boards.

Manhattan and Bronx offices, formerly handled at the Jersey Toll Tandem Board, was re-routed through the Metropolitan Board.

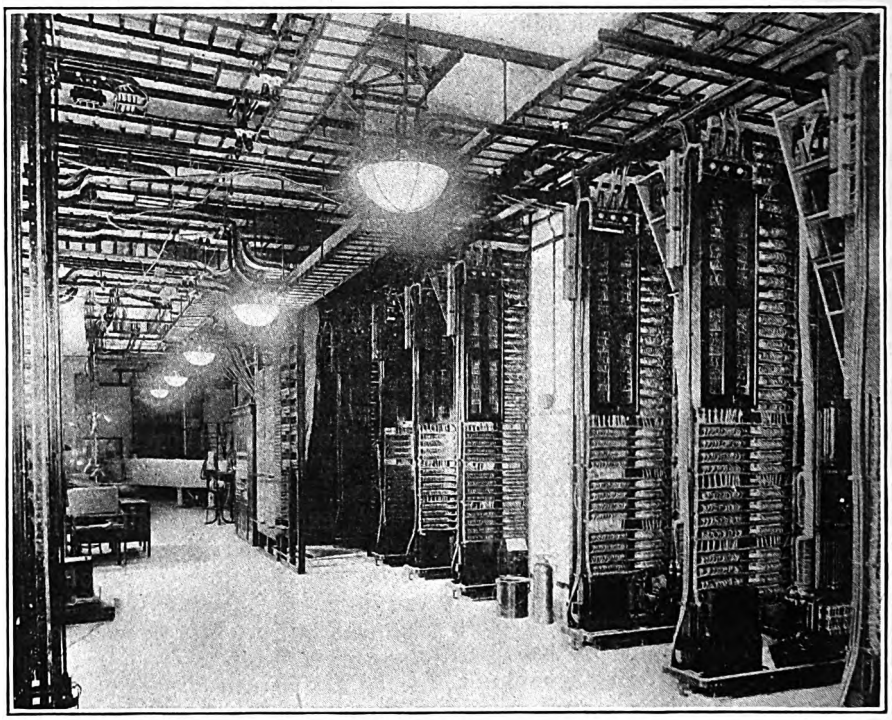
Thus, each successive step will reduce the traffic at the manual tandem boards, and add to that at the Metropolitan Board until all positions are taking care of their allotted traffic.

125,000 Daily Calls

After the final step has been completed, 80 central offices will be able to reach 64 other exchanges, requiring approximately 1,000 incoming and 1,000 outgoing trunks, the total daily traffic amounting to about 125,000 calls.

Training Operators

The opening organization was selected from the



Part of the Terminal Room

Connections with called offices and numbers are then established by means of mechanical switching devices, with the called number direct at semi-mechanical offices or by displaying the number on a call indicator at manual offices. Ultimately, calls between machine-switching offices will be handled through this office.

First Step Toward Transition from Manual to Mechanical

Traffic is being routed through the new board gradually. When first cut into service, traffic from Manhattan offices to Far Rockaway and Hammels only, previously handled at the Long Island Toll Tandem Board, was re-routed through the Metropolitan Board. Later, on May 1, traffic from certain Brooklyn and New Jersey offices to certain

Jersey toll board force.

In November, 1919, the training was started with a short course at cordless "B" positions in a New Jersey semi-mechanical office, following which actual training was given by means of a dummy mechanical position.

When the first groups of positions were turned over by the Western Electric Company, preliminary training was continued at the new positions. By means of specially equipped test boxes, calls were passed to the regular tandem positions, the tandem operator then proceeding to establish the connection, and causing a display at the originating test box, by which means each test call was checked.

Many Tests

Before any position was cut into actual service

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thousands of test calls were passed as the final check that every part was functioning properly.

All of this, by the help of an efficient operating plant, and supervisory force, was accomplished.

Much of the success of the cut-over from a traffic point of view was due to the splendid co-operation given by Miss Adriance, the chief operator at the Jersey toll board, in connection with the selection of the operating and supervisory force.

Miss Anna Woods, the chief operator of the Metropolitan Tandem Board, is deserving of special mention for her successful training of the operating force.

RADIO TELEGRAPHY

Radio Corporation Notes

EDWARD J. NALLY, president of the company, is now in Berlin, Germany, in connection with the opening of direct radio telegraph service between the Nauen, Germany, station, and the station at Chatham, Mass. It is expected that this service will be established early in August.

CHARLES P. BRUCH, of the Pan-American Wireless Telegraph Company, Buenos Aires, S. A., is reported recovering from a severe attack of la grippe.

CURTIS H. NANCE, of the commercial department, has gone to Caracas, S. A., on business of the company.

IN RESPONSE to a radio appeal for food from fifteen radio operators at Deutschenburg, Austria, Superintendent Duffy of the New York office circulated a subscription paper among ship operators in port, and as a result was able to forward food drafts to the value of $100.

International Radio Telegraph Company

GEORGE E. COLE is traffic manager of this company, with offices at No. 326 Broadway, New York.

THE COMPANY'S COMMERCIAL STATION at Cape May, N. J., is now operated continuously, night and day. H. F. Hazelbaker is in charge of the station.

THE BROOKLYN STATION of this company played an important part in reporting the progress of the international yacht races between the Resolute and the Shamrock. Morse circuits were operated from the radio station to the offices of the Associated Press and the United Press.

THIS COMPANY has established a ship service and maintenance division for rendering complete radio service to ship owners.

First Wireless Telephone Exchange

The city of Avalon, Catalina Island, is about thirty miles off the California coast. One of the earliest applications of radio telegraphy was that between Los Angeles, Cal., and Avalon. It is reported now that the Islanders are to be given telephone connection with the mainland by means of radio.

The Pacific Telephone and Telegraph Company announces that an ordinary telephone exchange is to be installed at Avalon and that conversations between subscribers' stations on Catalina Island and stations on the mainland will be carried on by radio telephony without manual relaying.

Wireless Plants to Be Erected in Mexico

A cablegram received from the American consul at Manzanillo, Mexico, states that the Minister of Public Works and Communications is considering the erection of four wireless plants, two of which are to be located at Manzanillo and Morelia. American companies interested in work of this nature should communicate directly with the minister for the construction of the plants and should furnish specifications, quotations and information as to the length of time required to do the work.

The consul also reports that plans to complete terminal works at Manzanillo have been approved and that 3,000,000 Mexican dollars (normal value 1 Mexican peso equals $0.4985) are involved. The work includes the installation of a water system, the construction of piers, and the leveling of hills.

Lafayette Wireless Station in France Nearly Finished

The Lafayette wireless station near Bordeaux, the construction of which was undertaken by the American Navy Department during the war, is now virtually completed and the plant will soon be handed over to the French Government, giving France the most powerful wireless station in the world. The Government plans an elaborate ceremony when the plant is taken over.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"
By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York

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Student's Course in Technical Telegraphy

No. 10

Western Union Pin-Jack Switchboards

Figs. 24 and 25 illustrate the circuit wiring of Western Union type pin-jack switchboards. The drawings show five typical actual switchboard circuits.

It is always somewhat mysterious to view a large switchboard from the business end—the front of the board—where plugs are inserted to make instrument and line connections. From the front of the

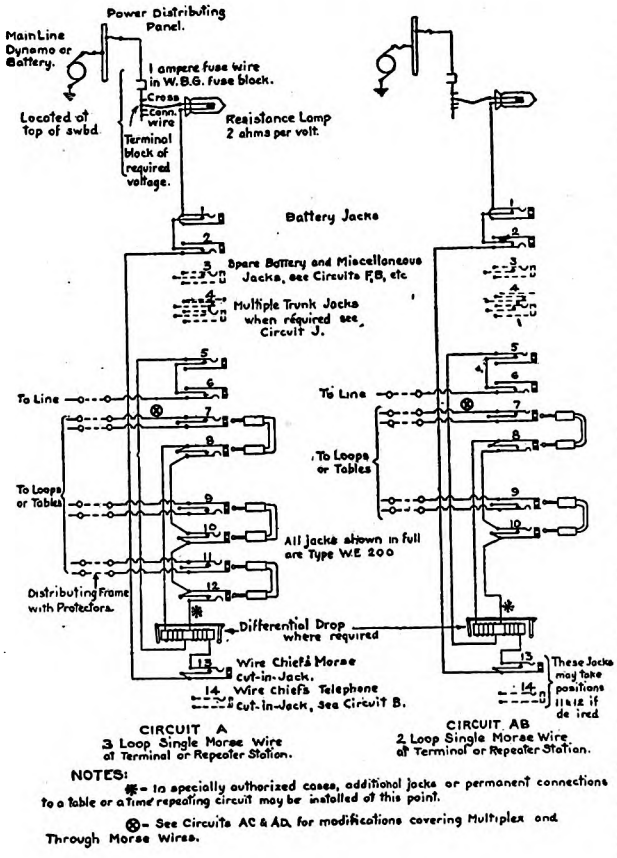
Power Distributing Panel.
Main Line Dynamo or Battery.
1 ampere fuse wire in W.B.G. fuse block.
Located at top of swbd.
Cross Conn. wire
Resistance Lamp 2 ohms per volt.
Terminal block of required voltage.
Battery Jacks
Spare Battery and Miscellaneous Jacks, see Circuits FB, etc.
Multiple Trunk Jacks when required see Circuit J.
To Line
To Loops or Tables
All Jacks shown in full are Type WE 200
Distributing Frame with Protectors.
Differential Drop where required
Wire Chief's Morse cut-in-Jack.
Wire Chief's Telephone cut-in-Jack, see Circuit B.
These Jacks may take positions 11 & 12 if desired
CIRCUIT A
3 Loop Single Morse Wire at Terminal or Repeater Station.
CIRCUIT AB
2 Loop Single Morse Wire at Terminal or Repeater Station.
NOTES:
*- In specially authorized cases, additional jacks or permanent connections to a table or a time repeating circuit may be installed at this point.
⊗- See Circuits AC & AD, for modifications covering Multiplex and Through Morse Wires.

FIG. 24

board everything appears shiny, smooth and regular; there is not a sign of a wire connection and only the "mouth" of the pin-jacks themselves are visible. It is only when we procure diagrams of the wiring of the various jacks that we are in a position to trace out the wire connections which make these jacks parts of telegraph circuits.

Before attempting to trace the current paths through pin-jack connections it is of advantage to study the jacks themselves. In the previous lesson was shown an enlarged view of one type of pin-jack, and the student should again refer to the illustration, Fig. 23, and observe what takes place when a plug is inserted into the jack. Cords may have a single conductor or a pair of conductors; the first is known as a single cord and the latter as a double cord. A double conductor cord is fitted with a plug which is made of two insulated sections, so that when the plug is inserted in a pin-jack one of these metal sections makes electrical contact with the metal shank of the jack while the other metal section (the tip) makes contact with a spring actuated contact point—the shank and the contact spring being in turn connected with wires the other ends of which are attached elsewhere.

With this information it is an easy matter to trace out the switchboard circuits through the jacks and to understand what takes place when a plug is inserted in a given jack.

In Circuit A, Fig. 24, eleven pin-jacks are connected in a vertical row, making provision for the inclusion in a single Morse circuit of three operating sets. These three sets may be located in the office itself or may be located at branch offices. Or, two branch offices may be included in the circuit as well as a set of instruments at the main office.

Circuit AB, Fig. 24, shows the wiring of nine pin-jacks. The double conductor cords with plugs shown ready for insertion in the jacks permit of two sets of instruments, or two branch office loops being connected in series with the main line wire attached to jack No. 6, and labeled "To Line."

In the illustrations the jacks shown in dotted lines are spare jacks and ordinarily are not connected in circuit.

The student who has seen strap-and-disk switchboards fitted with small plugs which, when inserted in holes between the vertical brass strips connected any given operating set with a given line wire, will understand that the type of switchboard here described accomplishes the same purposes. The advantages of the new board are many. Connections made by means of cords and pin-jacks are more positive, and there is little likelihood of the plugs jarring loose, as is the case when small plugs are inserted in the older type of board. Also, the assembly of the parts of the new board is such

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that each instrument jack and line jack may be given a marker card to indicate the assignment of the wires connected thereto. This makes it unnecessary to count holes from top to bottom, or right to left, or to guess at the correct connection.

Fig. 24 may be traced from the top. In the circuit A, at the top is shown the main line battery contact, the wire passing through a power distributing panel, fuse, resistance lamp, cross connecting

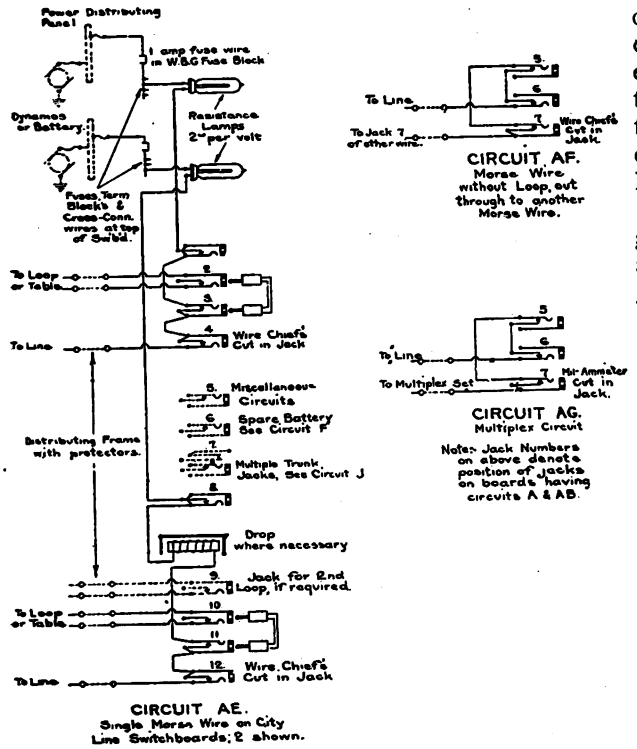
Power Distributing Panel
1 amp fuse wire in W.S.G Fuse Block
Dynamo or Battery
Resistance Lamps 2 per volt
Fuses, Term Blocks & Cross-Conn. wires at top of Switd.
To Loop or Table
To Line
Wire Chief's Cut in Jack
Distributing Frame with protectors.
Miscellaneous Circuits
Spare Battery See Circuit F
Multiple Trunk Jacks, See Circuit J
Drop where necessary
Jack for 2nd Loop, if required
To Loop or Table
Wire Chief's Cut in Jack
To Line
CIRCUIT AE.
Single Morse Wire on City Line Switchboards; 2 shown.
To Line
To Jack 7 of other wire.
Wire Chief's Cut in Jack.
CIRCUIT AF.
Morse Wire without Loop, out through to another Morse Wire.
To Line
To Multiplex Set
Ker-Ammeter Cut in Jack.
CIRCUIT AG.
Multiplex Circuit
Note: Jack Numbers on above denote position of jacks on boards having circuits A & AB.

FIG. 25

frame, and from that point to the first jack. Normally, battery flows through this jack without a plug being inserted. If a plug made of insulating material is inserted in the battery jack the battery lead is opened. From the battery jacks the circuit continues down to jack No. 13, which is used by the testboard attendant to cut in a set of instruments for test when necessary. The connection may then continue through a signaling annunciator to the jacks higher up in the panel used to connect operating instruments to the line wire.

Circuit AB is a similar arrangement, but has jacks enough for two loops or sets of instruments only, in addition to the wire chief's set.

In Fig. 25, circuit AE, shows the jack wiring of a switching unit where a single Morse wire in city service is connected. The battery connections are plainly marked, and in the upper and lower sections the jack contacts to which office instruments or city loops are attached are marked. The side diagrams, illustrating circuits AF and AG, are easily understood if the circuit in each case is traced through the pin-jacks. It is important to observe the effect of inserting in any of these jacks a single conductor plug, a double conductor plug, an insulating plug, or a solid metal plug.

There is one kind of knowledge which distinguishes the "Rule of thumb" switchboard attendant from the man who is likely to become a telegraph engineer. The man who studies the connections back of a switchboard so that he knows the purposes of every jack, and where the wires go from each jack terminal will soon become aware of the fact that his services are in demand. When others who have not gained clear information about circuit arrangements get into difficulty, generally they lose little time seeking out the man on the job who has knowledge of these things. In this way the serious student is rewarded. At first his associates look to him for aid and instruction, and in due course of time his official superiors observe that he is well informed, and, if he is well equipped in other respects, usually finds advancement awaiting him when opportunity presents.

There are many students studying this course who are so located that they may borrow a spare pin-jack from an equipment chief, engineer, or lineman, and it is recommended that a jack be procured for study purposes. Observe how the jack is constructed and then draw diagrams of the jack circuits shown in the Figures which accompany this lesson. In this way a clear understanding may be gained of how this new type of switchboard operates. Even if it is not possible to procure a sample jack, time spent drawing the jacks as they appear in the sketches will yield excellent returns.

(To be continued)

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CONVENTION AT TORONTO, ONT., OF THE OLD TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION

AUG. 31, SEPT. 1 AND 2

Before the war the annual convention of the Old Time Telegraphers was always a bright spot to look forward to—a sort of oasis in twelve long months of work. Several hundred of the Old Timers used to come to those annual get-together joy rides and talk fests and go back with enough "pep" to put down five on a line, no matter how hot the stuff was coming.

This year the Old Timers are going to get together in Toronto, the Queen City of Canada. As usual with the Old Time Telegraphers as part and parcel of the convention, the Society of the United States Military Telegraph Corps will convene in Toronto and help swell the total. Toronto is an ideal convention city. Blest with natural surroundings that few cities possess, the sojourner from out of town can always find something of interest to see or do. Lying right at her front door is beautiful Lake Ontario, across which it is only a two or three hours' ride to Niagara Falls, Lewiston and Niagara-on-the-Lake. Toronto has a land-locked harbor, and between the main land and the Island there is a beautiful expanse of water for sailing, motor boating or canoeing. Boats leave every two hours, and sometimes more frequently, for the trip across the lake; three times a day for Hamilton, only forty miles away; and daily for the Thousand Islands, Montreal and the Lower St. Lawrence. Within a few hours' ride are the Muskoka Lakes, high, picturesque and most delightful from every point of view.

Probably few outside of Canada know of the National Exhibition that is held every Autumn for two weeks in Toronto. The Canadian National Exhibition is probably the most interesting, most diversified, and is attended by the largest number of people of any similar exhibition on the North American continent. In 1919 over a million and a quarter people passed through the gates of the exhibition in two weeks' times. The exhibition is held in permanent buildings in grounds set aside especially for the purpose, occupying a space on the water front nearly a square mile in area, and only three miles from the center of the city. The National Exhibition, in addition to its industrial features, provides a program of evening entertainment in the way of band concerts, displays of unusual fireworks, vaudeville stunts and a "Midway" of the regular Coney Island type.

The Old Timers are going to meet in Toronto while the Canadian National Exhibition is on.

Toronto is only a night's ride from Chicago, New York, Cleveland, Detroit, Albany, Montreal, Ottawa, and but a few hours longer from Boston, Washington, Philadelphia, Pittsburgh, Indianapolis, Cincinnati, Winnipeg and Quebec. From most of these places, sleepers are carried to Toronto without change.

In times past it was the custom for little parties of four, six, eight and ten to be made up among intimate friends in the same city, and often in the same department of one of the telegraph companies and take in the convention together. This is the nicest way to come to these get-together meetings of the Old Timers, because there is the fun of being together on the train going and coming, as well as at the convention itself. Many have already spoken of carrying out such a plan this year, and others are figuring on taking their annual vacation at convention time and going down the St. Lawrence or up to the Muskoka Lakes after the convention is over. The Muskoka Lakes, the Thousand Islands, the lower St. Lawrence, the Saguenay, Georgian Bay, Ottawa, Montreal and Old Quebec, are right at their best in early September.

The Executive Committee are anxious to make the 1920 convention a "humdinger," one of those regular old time get-together meetings that we used to have a few years ago. A strong local committee, headed by George D. Perry, general manager of the Great North Western Telegraph Company, has been organized to handle the convention in Toronto.

Edison's "Sending" Recorded on a Disc Record

At 10 a. m. on the morning of Tuesday, July 20, the following-named gentlemen assembled in the office of T. W. Carroll, general manager, Western Union Telegraph Company, 195 Broadway, New York, to witness the receiving of a message from Thomas A. Edison, sent by himself, to be recorded on a disc record: D. H. Bates, G. W. E. Atkins, W. N. Fashbaugh, G. M. Yorke, L. McKisick, Charles Selden, E. P. Griffith, L. B. Foley, T. W. Carroll and Thomas E. Fleming.

The message was sent by Mr. Edison from the laboratory at Orange, N. J., and received by Mr. Bates. When Mr. Bates finished his task there was great applause, after which those present exchanged felicitations with Mr. Edison over the wire. The message sent by Mr. Edison read as follows:

"To the Telegraph Fraternity:

"Amid the activities of a busy life, full of expectations, hopes and fears, my thoughts of early associations with my comrades of the dots and dashes have ever been a delight and pleasure to me. I consider it a great privilege to record in Morse characters on an indestructible disc this tribute to my beginnings in electricity through the telegraph and with it a God-speed to the fraternity throughout the world. 73.

"EDISON."

Photographs of those present were then taken. The instruments used by Mr. Edison were mounted on a mahogany base, and were presented by that gentleman to the Old Time Telegraphers and Historical Association.

The Edison message will probably be made a feature of the Toronto Reunion of Old Timers.

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FIVE YEARS in telephone service and still being used.

That's the record of a set of Edison Primary Batteries installed upon a prominent Eastern railroad (name upon request).

And the man in charge of those batteries says that the transmission is always clear and remains uniform at all times.

We'd like to tell you more about this particular use of Edison Primary Batteries. Fill out, clip that coupon and send to us right this moment.

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CHICAGO, ILLINOIS

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SAN FRANCISCO, CALIFORNIA

2044 Railway Exchange Building,
ST. LOUIS, MISSOURI.

T& T A

THOMAS A. EDISON, INCORPORATED
Bloomfield, N. J.
Primary Battery Division,

Kindly send me information concerning the use of Edison Primary Batteries in telephone service.

Name _____

Title _____ Railroad _____

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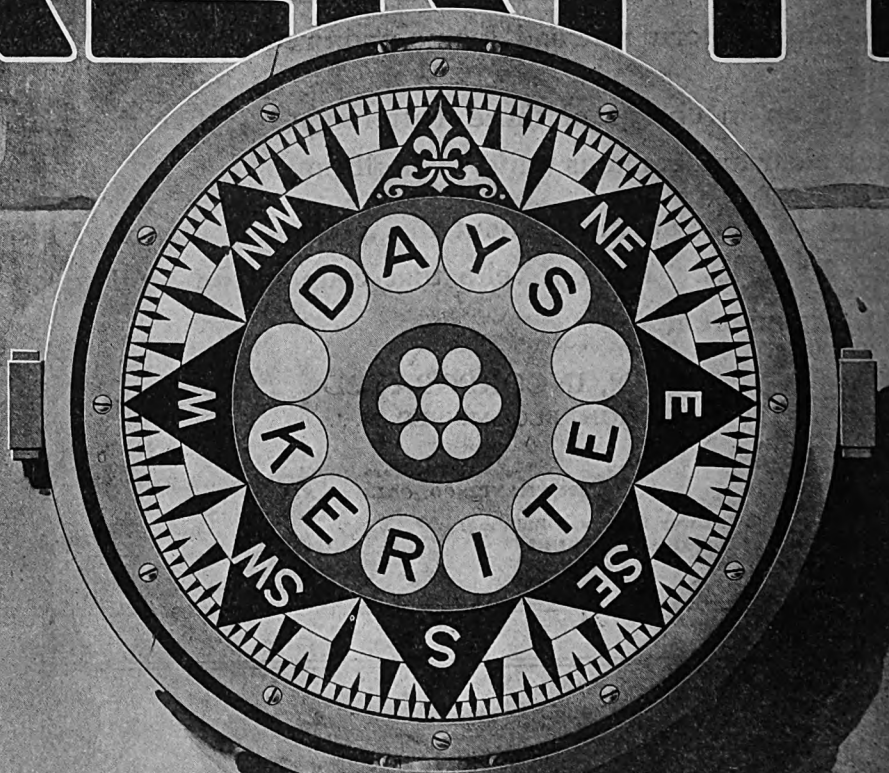

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THE RAILROAD
TELEGRAPH AND TELEPHONE

ANNUAL MEETING OF THE TELEGRAPH AND TELEPHONE DIVISION OF THE AMERICAN RAILROAD ASS'N

The annual meeting of the Telegraph and Telephone Division of the American Railroad Association is to be held on September 22, 23 and 24, in the Fort Garry Hotel, Winnipeg, Man. It is to be hoped there will be a large attendance of the members of the Division, not only because of the extremely valuable educational benefit to be derived, but as a compliment to the Canadian members of the Division. It is many years since the superintendents of telegraph met in the Dominion.

From all appearances the business sessions of the Division are likely to prove of unusual interest, several of the committees' reports bearing on vitally important subjects valuable to all railroad telegraph men.

Winnipeg is known as the gateway to the famous Canadian Northwest—it is a beautiful city of approximately 275,000 people, with excellent streets, parks, stores, etc. The Fort Garry Hotel is one of the newest and most complete on the American continent.

There are direct through trains to Winnipeg daily from Montreal either by the Canadian National-Grand Trunk route, or the Canadian Pacific Railway. Also from Toronto by the same routes, and there are daily trains from St. Paul via the Great Northern, Northern Pacific and Soo Railroads.

Our advice is that the month of September from a weather point of view is delightful in Winnipeg, bright sunshine usually prevailing. It is hoped a large number will attend the meeting, thereby making it a huge success.

—o—

Telegraph and Telephone Appliance Association

B. A. Kaiser, of the Telegraph and Telephone Appliance Association, advises that the annual meeting and election of the association will be held in Winnipeg, Man., during the meeting of the Telegraph and Telephone Division of the American Railroad Association, September 22 to 24, inclusive.

The Appliance Association's entertainment committee has in hand the matter of providing entertainment and sight-seeing trips for the visiting superintendents.

—o—

W. M. Post, superintendent of telegraph and signals, Pennsylvania System, Pittsburgh, Pa., announces the following appointments in his region: James R. Theiss, assistant chief lineman, and Earl W. Stephens, assistant chief lineman. Mr. Theiss formerly was supervising inspector, and Mr. Stephens foreman of installers and maintainers.

C. W. Bradley, superintendent of telegraph, Chesapeake and Ohio Railroad Company, Richmond, Va., is spending his vacation at New Milford, Conn.

The Northern Electric Company, Montreal, Que., announces that A. Dwight Smith has been transferred from the position of sales manager to the head office sales department, where he will have jurisdiction over sales to railroads and fire alarm departments. Mr. Smith is a son of A. B. Smith, formerly manager of telegraphs, Grand Trunk and Grand Trunk Pacific Railways.

H. W. Tarkington, of the Missouri Pacific System, Nevada, Mo., was a New York City visitor last week. Mr. Tarkington will remain in this section of the country two or three months before returning home.

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An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

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ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

And we can highly recommend it to our readers

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, expects to return to his office about August 9, after a month's absence.

J. C. WILLEVEB, vice-president in charge of commercial department, has been enjoying a well-earned vacation during the latter three weeks of July.

W. N. FASHBAUGH, vice-president in charge of traffic, expects to leave shortly on a combined business and pleasure trip that will take him to Denver, Colo., and other Western cities.

THOMAS W. CARROLL, general manager, New York, is on an official visit to offices throughout New England.

C. A. CRANE, city superintendent, Boston, Mass., is away on his summer vacation.

E. R. SHUTE, chief supervisor of traffic costs, and E. P. FREY, chief supervisor of wire service, both of Vice-President Fashbaugh's office, are away on their annual vacations.

R. H. CALHOUN, formerly traveling auditor, Southern Division, Atlanta, Ga., is now identified with the Eastern Division with offices in New York.

M. F. BRIDGES, division traffic inspector, Dallas, Tex., who has been in New York during the past two months taking a regular course in methods in the various executive departments, has returned to Dallas.

JOHN A. HILL of General Manager Carroll's office was married on June 23 to Miss Ethel Winnifred Hunt of the division traffic office.

FLORENCE E. DREWES, of the general manager's office, was married on July 2, to Robert C. Dawson of Brooklyn.

Western Union Semi-Annual Report

The Western Union Telegraph Company reports for the six months ended June 30, June estimated: Gross revenues, including dividends and interest, $59,955,000; maintenance, repairs and reserved for depreciation, $7,881,000; other operating expenses, including rent of leased lines, taxes and employees' income participation, $44,454,000; total expenses, $52,335,000; balance, $7,620,000; deduct interest on bonded debt, $666,000; net income, $6,954,000.

Operations for the 1919 period were not announced. The company was under Federal control in 1919.

Western Union Lake Division

A. C. CRONKHITE, general manager, and A. R. MCGRATH, superintendent, have returned from a trip of inspection to offices in the iron and copper districts of Wisconsin and Michigan.

SUPERINTENDENT BROWN has gone to California to spend his summer vacation. Mrs. Brown is now in the West and they will return to Chicago together.

DISTRICT CABLE MANAGER CARNEY is touring by automobile through Wisconsin while on his vacation.

CHICAGO has survived three large conventions during the past month. The Republican National Convention, the Elks' convention, and the political convention of the Committee of Forty-eight (the new Third Party) have been with us and are gone, after piling up a large amount of special telegraph matter—all of which was handled promptly.

WESTERN UNION POST of the American Legion, in conjunction with Greeley Camp, United Spanish War Veterans, Prairie Signals Post, American Legion, will hold a picnic at Glenwood Park on Sunday, August 8.

Cincinnati, Ohio, Western Union

PRESIDENT HAYES and VICE-PRESIDENT CAMPION of the Association of Western Union Employees, were Cincinnati visitors recently and attended a baseball game between Cincinnati and Columbus locals. A banquet was given at the Gibson Hotel. The Cincinnati team were victors on the field, but the Columbus men showed up well at the banquet.

GEORGE W. KEITH, JR., in charge of the delivery and messenger departments, is a stickler for correct and courteous language among messenger boys. Recently a boy returned to the delivery department a few messages which he had been unable to deliver, stating that "this guy is away," "this guy's office is closed," and so on. Mr. Keith remarked that such references are not complimentary to customers, whereupon the lad replied: "How was I to know they are customers?"

RECENT APPOINTMENTS in the fourth district include: G. A. Rice, manager at East Liverpool, Ohio, vice L. S. Bryan, resigned; H. S. Wise, returned to Shelby, Ohio, vice E. J. Gutshall, transferred to Cleveland; Kathryn Lewis, manager at

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sbon, Ohio, vice Jane Lewis, resigned; Gail Gorın, promoted to cashier at Marion, Ohio, vice itherine Lundy, transferred to Detroit, Mich.; harles Skiver, manager at Lancaster, Ohio, vice H. Kehr, transferred to Portsmouth, Ohio.

M. F. ROBENALT has been appointed vacation re-f manager.

MARION, OHIO, is likely to become the telegraphic etropolis of the State, should Senator Harding's ront porch" policy of reaching the voters be hered to.

Milwaukee, Wis., Western Union

J. J. WELCH, division traffic superintendent, and . W. Drew, division traffic engineer, visited Milaukee recently in connection with expansion of e telephone department which has outgrown pres-t requirements. Milwaukee district comprised part of Mr. Welch's territory when he was staned at Chicago on a previous occasion, and Mr. rew formerly lived in this city. While here both ficials renewed friendship with many former acaintances.

THE WESTERN UNION BASEBALL TEAM played a me recently with the Krause Milling Company am in the Corporation League, and although the tter team won by a score of fourteen to nine, ey had to battle hard for the runs earned. Charles ass, pitcher for the telegraphers, played a star me throughout the contest.

EMPLOYEES of this office will hold their annual cnic on August 8, at Grant Park, South Milwaue, A long program of sporting contests has been ranged, including swimming races for boys and rls, and a baseball game between the traffic dertment's team and the commercial department's am. Arthur Haberstroh, of the latter team, is pected to make things interesting for the traffic en.

MILWAUKEE'S REGULAR MESSENGER BOYS are king advantage of the fact that during school cations boys are plentiful for message delivery, d many of the regulars are taking a vacation in e cherry country in and around Sturgeon Bay. he boys have a real country vacation and at the me time continue their incomes by joining the nks of the cherry pickers.

MR. CHRISTIAN GIRL, proprietor of the Kalamao Spring and Axle Company, recently moved to ilwaukee from Cleveland, Ohio. One of our messger boys, a few days later, was given two telegrams for delivery—one addressed to the Spring d Axle Company, and one to Christian Girl. He livered the former correctly and promptly, but, ter some reasoning and deliberation, the lad aded for the Young Women's Christian Assotion with the message for Christian Girl, where, course, it was accepted. When the error was scovered and rectified Mr. Girl was much amused the messenger's resourcefulness in delivering a egram to what appeared to be an unusually infinite address.

Gulf Division, Western Union

B. D. BARNETT, division commercial manager, is spending his summer vacation in the Ozark Mountains.

E. C. HANNON, formerly cashier of the El Paso, Tex., office, has been appointed office manager at Oklahoma City, Okla.

CHARLES HOAG, formerly cashier at San Antonio, Tex., has been transferred to the office of Division Auditor Rohling, at Dallas, Tex.

A MEETING of the Louisiana State managers was held in New Orleans on July 10 and 11. F. A. Mohr, general manager, and J. F. Wilson, district commercial superintendent, attended the meeting. The meeting was in charge of G. P. Brinkley, division commercial manager. W. A. Porteous, city superintendent, New Orleans, arranged entertainment for the visiting officials and managers.

L. A. OTT, city superintendent at Dallas, Tex., is absent on a vacation, which he is spending at Port Lavaca, Tex., where fishing is good.

L. J. LIEUX, formerly manager at Baton Rouge, La., has been appointed district commercial manager of the first district, with headquarters at Alexandria, La.

J. C. DOUGLASS has been appointed manager of the newly opened office in the Interurban Building, Dallas.

THE ASSOCIATION OF WESTERN UNION EMPLOYEES of the commercial department, Dallas, held a picnic at Kidd Springs, recently. The entertainment included swimming events and a baseball game. After the games a sumptuous dinner was served to all present. The arrangements for the day were made by Captain R. A. Smith. Among the officials who attended the outing were: F. A. Mohr, general manager, accompanied by Mrs. Mohr; J. P. Rohling, division auditor; J. G. Hilbert, division plant superintendent; G. P. Brinkley and Mrs. Brinkley; Mr. and Mrs. W. H. Schroeder, Mrs. Hilbert and Mrs. Rohling.

A WELL ATTENDED MEETING of State managers was held at San Antonio July 3 and 4, under the direction of J. F. Wilson, district commercial superintendent of the first district, City Superintendent F. H. Morris of San Antonio, and G. P. Brinkley, division commercial manager.

E. D. BELVIN has been appointed chief clerk to District Commercial Superintendent J. F. Wilson, with headquarters at Dallas.

B. J. GRANT has been appointed manager at Beaumont, Tex.

THE FOLLOWING APPOINTMENTS as managers in the first district have been announced: Miss Bess Powers, manager at Hico, Texas; F. M. Pender, Lufkin, Texas; Alex Chacere, Jennings, La.; Laura Gable, Ruston, La.; Jessie Johnson, College Station, Texas; R. M. Shirley, Commerce, Texas; B. W. Brown, Marfa, Texas; J. R. Murphy, Pittsburg, Texas; C. Jackson, Texas City, Texas; Estella Ford, Winnsboro, Texas.

GUS SCHULTZ, manager, Galveston, Texas, has

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a lemon tree bearing 119 lemons ready for plucking and seventeen varieties of oleanders in bloom.

APPOINTMENTS to managerships recently announced include: R. E. Lockard, Burkburnett, Texas; B. H. Middleton, Sweetwater, Texas; J. M. Kendall, Mineral Wells, Texas; Ruth English, Vinita, Okla.; Louise Clisbe, Wagoner, Okla.; Edna Maxey, Altus, Okla.; J. W. Martin, El Reno, Okla.; Ava Mason, Medill, Okla., and W. A. George, Guthrie, Okla.

Handling the Press at San Francisco During the Democratic Convention

San Francisco has had her chance at the first national political convention ever held in the Western metropolis, and has made good.

The Eastern newspaper men who were confronted with the most important detail of getting their news out, have expressed complete satisfaction. When it is considered that there was a difference in time of four hours between San Francisco and New York and three hours between San Francisco and Chicago, the work of the telegraph companies deserves only the warmest praise.

There was very little interruption to wires and weather conditions could not have been better.

The telegraph companies handled around 6,000,000 words during the sessions of the convention.

Many compliments have been received by telegraph and telephone officials from visiting delegates and correspondents who one and all declare that the telephone and telegraph service was never excelled at any previous convention.

One national committeeman from the East said before leaving San Francisco: "We are going to work right now to bring the National Democratic Convention here in 1924, and it will be up to the Republicans to get busy, for we are in earnest.

"The Republican National Committee will be compelled four years hence to choose San Francisco by reason of the tremendous effect the city's hospitality has had on the great mass of delegates that came here to the Democratic convention, and especially from the wonderful unanimity of praise which has been bestowed by the hundreds of newspaper men and women who attended. They have spread the note of appreciation throughout the nation."

On the day before the convention opened, June 27, the file at the Western Union office reached 245,447. The total handled by the Western Union was 4,288,360 words, the maximum being reached on July 2, when the amount handled was 429,594 words.

Previous to the convention the Western Union completed an organization which handled the file without the slightest hitch.

Sixty multiplex operators and about fifty Morse operators were brought in from the Central, Mountain and Pacific divisions to help out. About 70 per cent. of the traffic was handled by automatic printers.

Among the out-of-town officials who assisted in handling the file were H. G. Heininger, district traffic supervisor, Kansas City; W. F. Schwandt district traffic supervisor, Seattle; Ralph Miller, district traffic supervisor, Los Angeles; C. E. Coit, district traffic supervisor, Denver, Frank Pugh and E. E. Smith of the Traffic dispatcher's office, Chicago C. R. Fisher, division traffic superintendent at San Francisco, and H. J. Jeffs, district traffic supervisor, San Francisco, also performed great work in the organization.

W. R. WILLIAMS, city superintendent at Portland, Ore., has issued a bulletin to employees in his district on the subject of Courtesy. Portland employees are, in the main, exceptionally courteous, and the points made by Mr. Williams in his bulletin indicate that he has closely observed the dealings of managers and other employees with the public, and realizes the advantages of courteous attention in all matters.

Western Union Cable Station at Miami, Florida —Underground Cable Between Cable Landing and Miami Office Being Laid

A force of laborers directed by C. F. McChesney of Atlanta began laying 60,000 feet of cable for the Western Union telegraph company between the ocean and Miami office July 7. The crew is putting under the bay and underground, both in Miami and Miami Beach, two 15-strand cables from Miami to the cable house on Fifth Street. From the cable house to the ocean three cables will be laid. Two reels of submarine cable which will go under water in Biscayne Bay now on flat cars in Miami yards, weigh 24,000 pounds. These cables will form the land and bay unit of the new South American cable system.

T. W. Goulding Retires

T. W. Goulding, previous to 1904 superintendent of the Western Union Telegraph Company at Seattle, Wash., and who was in the fall of that year appointed European general manager with headquarters at London, England, and who remained in charge of the affairs of the company until 1913 when as a result of reorganization he became European commercial manager, retired on March 1st.

Mr. Goulding has endeared himself to the members of the large staff in Europe, who greatly regret his retirement and have given expression to their feeling by presenting him with a very beautiful silver tea and coffee service, a silver flask, a handsome gold watch, also a gold wrist-watch, a silver cigar case and lighter, together with a beautiful illuminated address.

Mr. Goulding is well known in Canada as well as in the United States, and his many friends will be pleased to learn that there is a prospect of his visiting this country in the near future, when he hopes to renew old acquaintances.

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POSTAL TELEGRAPH-CABLE COMPANY

C. F. LEONARD, superintendent, New York, is absent on his annual vacation.

THOMAS P. DOWD, manager at Washington, D. C., was a recent executive office visitor.

H. W. HETZEL, traveling auditor, is taking a short rest at his home in Philadelphia, Pa.

F. L. WOOD, manager at Augusta, Ga., recently delivered an address before the local Rotary Club, his subject being "Present-Day Telegraph Service." The address received favorable comment in the local press.

THE PLANT DEPARTMENT at headquarters is now located on the ninth floor at 253 Broadway. The new arrangements permit of quicker and more efficient handling of matters coming before the chief engineer. John F. Skirrow, chief engineer; J. P. O'Donohue, assistant chief engineer; D. H. Gage, division engineer; Rufus Gould, and C. A. Lane, of the construction department, all have offices in the same suite of rooms.

MANAGERS RECENTLY APPOINTED: J. F. Lyons, Elyria, Ohio; E. V. Eckart, Troy, Ohio; M. C. Clarke, Maysville, Ky.; I. J. Roedel, Lexington, Ky.; C. O. Harper, Temple, Tex.; S. L. Horton, Chattanooga, Tenn.; C. I. Hood, Pine Bluff, Ark.; T. A. Wilkenson, Lamar, Colo.; Clifford Posey, Union City, Tenn.; Mrs. W. M. Jackson, Columbia, Tenn., and Thomas W. Duerner at Oil City, Pa.

New York Postal

R. E. WALSH, Western traffic chief in the main operating room, has returned from his summer vacation, which he spent visiting relatives in Rhode Island.

FRANK E. MCKIERNAN, general wire chief, has returned from his annual vacation.

JOHN J. FREDERICKS, general traffic chief, is spending his vacation at Stamford, N. Y.

J. DIDOMENICO, assistant in the city department, and T. P. BROOKS, of the city division, main operating room, are away on their annual vacations.

H. SINGER has been advanced from a branch office position to a position as operator at the Thirtieth Street office.

SAMUEL SPIEGEL, of the Forty-second Street office, has returned to duty after being laid up for a short time on account of an operation.

MISS M. SCHLEY is relieving MISS M. BROWN as operator at the Brevoort Hotel office.

J. J. MCDERMOTT, city manager, has returned to his office from a trip through Pennsylvania.

MISS DUNN, of the Astor Hotel office, has returned from her summer vacation.

HAROLD MALONEY, of the city manager's office, has returned to duty after spending his annual vacation at a seaside resort.

Pittsburgh, Pa., Postal

A. D. WISE has been appointed chief operator of the Pittsburgh main operating room, vice E. E. HEASLEY, appointed general wire chief, at his own request. Mr. Wise started in the company's service as a messenger boy, since which time he has made steady and consistent progress through the various grades of the service.

H. C. DOLBY, heretofore manager at Oil City, Pa., has been transferred to the managership at Sharon, Pa.

THIS COMPANY'S OFFICE at Erie, Pa., was moved on Sunday, July 18, to a new and larger location in the Marine Bank Building. The office is equipped with all modern conveniences.

Buffalo, N. Y., Postal

R. H. DYER and P. H. IREY, of the main operating room, have returned from their annual vacations.

LUCILLE BALL, chief operator's clerk, has returned from her vacation.

LOUIS A. KELLER, assistant quadruplex chief, who has been visiting in Akron and Cleveland, Ohio, has returned to duty.

W. J. BRICK, operator at the Chamber of Commerce office, has returned to duty after a long period of illness.

WILLIAM SIX has been appointed night delivery clerk.

OPERATORS J. R. MCGOWAN and A. H. SEELEY, of the main office, have returned from their vacations.

S. A. FARLEY, manager at Ogdensburg, N. Y., has returned from his summer vacation.

GEORGE WALTERS has been appointed lineman at Geneva, N. Y.

Chicago Postal

E. W. COLLINS, general superintendent, has returned to his office from a business trip to Fort Wayne, Ind., and Cleveland, Ohio.

THOMAS N. POWERS, manager of the operating department, and JOHN NERING, commercial manager, Chicago, have returned to their desks from a trip to La Junta, Colo., Denver, Los Angeles and San Francisco. While in San Francisco they were in attendance at the Democratic National Convention.

MISS E. M. CARSON, cashier, Western Division, is spending her vacation at Douglas, Mich.

A. J. MORRISON, chief clerk, Sixth District, spent a portion of his vacation with his sister on a ranch near Fort Morgan, Colo.

A. B. NIBELSICK, manager at Lincoln, Neb., had the misfortune on July 12 to be run down on the street by an auto truck. He is expected to recover quickly, as no bones were broken.

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THE FOLLOWING POSTAL EMPLOYEES were recent Chicago visitors: Mr. and Mrs. C. H. Ashwell, Waterloo, Ia.; Miss Bertha Johnson and Miss Irene Pentz, Omaha, Neb.; C. M. Barnes, manager at Leavenworth, Kan., and Mrs. E. L. Hoard, manager at Vincennes, Ind.

MISS ADELE ROBLEE, of the Milwaukee, Wis., operating staff, has returned from a trip to the East, where she visited friends in Washington and New York.

THE LIBRARY at Milwaukee, Wis., has installed an assortment of 200 books, consisting of works on biography, travel and romance. The books are conveniently housed in the ladies' rest room of the main office.

MRS. J. G. WOLF, wife of our Omaha, Neb., manager, died on July 3, after a short illness and removal to her home from the hospital. Mrs. Wolf was a devoted mother of three sons, Frank, 17 years, now in the U. S. Navy; Alfred, 15 years, and Edwin, 7 years.

Seattle, Wash., Postal

H. E. PATTON, superintendent, attended the Democratic convention at San Francisco.

A NEW long-distance common-battery telephone switchboard for the Seattle office is on the ground and is to be installed shortly. A similar switchboard will be installed at Portland, Ore., in the near future.

A. FRAZIER is temporarily filling the position of traffic chief during the absence on vacation of Mr. Clarke.

C. P. STRACHAN has been appointed operator at Great Falls, Mont., vice Ralph Phillips.

H. BERNS, operator at Portland, Ore., has relieved Mr. Malloy on the San Francisco circuit.

DOROTHY MARTYN, of the superintendent's office, spent a short vacation on a farm at Mount Vernon, recently.

BLANCHE CAMPBELL has been appointed telephone supervisor at Seattle, vice C. C. Merrill.

W. H. RICHARDSON has been appointed lineman at Ellensburg, Wash.

LLOYD L. CRAFT, manager at Portland, Ore., is spending a short vacation in the country.

S. O. REED, foreman, is engaged on general line repairs south of Eugene, Ore.

FORMER MANAGER WOOD, of Eugene, Ore., is now a member of the Portland, Ore., operating staff.

MRS. JULIUS HANSEN has been appointed manager of the office at Missoula, Mont.

Portland, Ore., Postal

WE MOVED TO OUR NEW QUARTERS on the fourth floor, June 23, at midnight, and under the able supervision of Division Engineer B. W. Fields, and his assistant, H. W. Funches, we did not lose a dot. The cut-over was successful in every way.

RECENT VISITORS WERE: T. N. Powers, chief operator, Chicago, and Manager John Neering, Chicago. After a stop-over for a day, they proceeded north to Seattle.

H. E. PATTON, district superintendent, stopped over a day on his way back to Seattle from San Francisco, where he was supervising the movement of traffic at the Convention Hall.

GRANT U. WOOD has been transferred from night operator, Astoria, Ore., to day operator in the main office at Portland.

MR. BARNES, of Los Angeles, Cal., is a new arrival, and has been assigned to the San Francisco bonus circuit nights.

J. V. REID, a member of our operating force, died of typhoid-pneumonia, after a few days' sickness, on June 21st. Mr. Reid was fifty years of age and a native of Kingston, Ontario. He was buried with Masonic honors in the Spanish-American war veterans' plot here, he having seen service during the Spanish-American war in the Philippines.

Death of Sidney B. Gifford

Sidney B. Gifford, aged 84 years, the most prominent telegraph figure in central New York, died at his home in Syracuse, N. Y., on July 19. Mr. Gifford was a native of Syracuse, where he received his education and where he entered the telegraph service in 1850 as a messenger. He soon became an operator and was successively manager of the offices at Canajoharie, Auburn and at the main office, 2½ Wall Street, New York City. Mr. Gifford inaugurated the Marine Service at Sandy Hook, N. J., in the summer of 1853. Wishing to return to Syracuse, he was transferred to that city in the fall of 1853, where he remained until the time of his death.

In 1864 Mr. Gifford was appointed superintendent of the Western Union Telegraph Company's interests at Syracuse, which position he held until his retirement from active service in 1902.

Death of Captain J. A. Galbreath

CAPTAIN JOHN A. GALBREATH, famous Confederate army telegrapher, and who for many years was in charge of the Southern Associated Press, and later manager of the Weather Bureau at New Orleans for the Western Union Telegraph Company, died in that city on July 4.

Captain Galbreath was a noted chess player and was a member of the American team which played a game by cable with British chess experts in the year 1898.

MICHAEL FITZGERALD, identified with the staff of the French Cable Company, Orleans, Mass., visited New York on July 14th to see his old friend and former Valentia, Ireland, companion, George Mackay, who recently arrived in New York from the Bay Roberts, N. F., cable station.

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EDITORIAL

FIVE DESTROYERS

After Postmaster General Burleson's action during Government control of telegraph lines while the war lasted—and later, in sending country postmasters into modern telegraph offices to look into the transmission of messages by wire, we should be prepared for about anything the present administration may do in regard to electric communication.

The laying of the new submarine cable by the Western Union Telegraph Company between Miami, Florida, and Barbados, for connection at the latter point with a new cable to South America, had proceded to a stage where a landing was to be made on the Florida coast.

Due to the fact that American manufacturers of cable have not so far seriously considered the task of making long lengths of submarine cable, the cable for the new South American line had to be made in England. Also, British companies own the three modern cable-laying ships, and the cable in question was shipped in one of these vessels. Judging from dispatches from Washington the enterprise was allowed to proceed to the point where the Florida end of the cable was about to be landed. When, bang! five American destroyers were forthwith dispatched to intercept the designs of the cable ship "Colonia." The President had spoken; or the State Department had spoken; or the Navy Department had spoken, or perhaps it was Mr. Burleson again.

Of course, as soon as the British government was informed of the impasse orders were immediately given to the commander of the cable ship to stop operations until the matter is adjusted to the satisfaction of the American Government.

As we go to press, presumably the cable ship is anchored outside of the three-mile limit and the five destroyers are cleared for action.

During recent years TELEGRAPH AND TELEPHONE AGE has done about as much as a trade journal can do to prompt American manufacturers to take up the work of making submarine cables, and we hope the time will come when all American owned cable lines will be of American manufacture, and that all cable landings in the United States will be American owned. Perhaps the present bizarre display off Miami will further these ideas. We hope so. At any rate, the display is bizarre.

In the latest news dispatches from Washington, on this subject, there are one or two paragraphs which may throw light on the situation. It is stated that "The action of the Washington Government against the landing of the Barbados cable at Miami is really the first open step in a movement against the British cable monopoly—a movement which may yet have far-reaching consequences." And: "President Wilson, it is stated, is determined to at least prevent the landing of the new cable until after the International Communications Conference, which will meet in Washington on September 15th."

The British have come to their control of the cables they own entirely through enterprise. There is no monopoly of enterprise, however. The field is wide and open.

A strange idea seems to find lodgment in certain quarters relative to the value of international submarine cables in time of war. Great Britain was credited with rare foresight in laying many international cable lines in the years preceding the late war. What would these extensive cable lines have been worth to her if she had not been able to protect them along sea routes? They would have been worth less than nothing to Great Britain if German warships had controlled the waters of the globe. Germany possessed international cable lines, and when the war started Great Britain and France made real good use of these German lines.

We know the value of cable terminal ownership during peace times, and in times immediately preceding declarations of war; but it is well to keep in mind that after war has been declared the nation which controls the seas controls the cables.

Submarine cables stretching between two separate countries are international lines of communication. There is to be considered the ownership of the deep seas section of a line; the ownership of each end within the three-mile limit, and the ownership of the terminal stations. Also, it is to be remembered that according to the regulations of the existing International Convention, an American owned cable, landing at an American owned station, and manned by American citizens, requires a permit from the International Convention.

The American representatives, appointed by the President, who are to serve at the International Communications Conference to be held in Washington beginning September 15, next, are A. S. Burleson, Walter S. Rogers, and Rear Admiral W. S. Benson.

As may be judged from the foregoing, the various matters to be considered at this important conference are of a highly technical nature, and it is hoped that the three gentlemen named will have the assistance and advice of telegraph and cable executives familiar with all corners of the entire subject.

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser"

(*Continued from July 16 issue*)

Cable Relays

Cable engineers thought a great thing had been accomplished when the siphon recorder was invented. Greater things were in store for them, however, in the invention of cable relays and magnifiers.

The Brown Relay

This is a beautiful instrument and so far as the permanent magnet and the moving coil are concerned it is similar to the Siphon Recorder—with several exceptions.

Over the main line coil winding of about 600 ohms there is a correction winding of about 120 ohms. The control from the coil on the suspension to the pointer is made by means of fine quartz fibers instead of silk.

The pointer is made of a fine glass siphon tube through which is passed a thin platinum wire terminating in an iridium point. The point rests very lightly on a revolving drum. The idea of a revolving drum is to eliminate friction between the pointer and the contact surfaces of the drum, performing a function in this respect similar to the vibrator in the Siphon Recorder.

The drum is constructed of five metal rings and two insulating rings clamped tightly together; two of the metal rings being brass and three silver. The outer rings are brass either side of the drum. Next to the brass is the silver, then the insulating rings of very thin mica; then the center ring of silver, known as "No-man's land," and this position is the place the tongue occupies on the drum when no signals are passing. The outer edges of the brass rings are so formed that in revolving two copper gauze brushes bear against them lightly and thus establish electrical contact with the two silver rings, known as the "Dot" and "Dash" contacts. The drum is revolved by a tiny 8-volt D. C. drum-wound motor, the shaft of which is attached to the drum shaft by a worm gear. The speed of the motor is regulated by a rheostat.

The point before being used is first ground on a very fine emery wheel, which replaces the drum while this is being performed—the emery wheel and drum being about the same diameter. The grinding occupies several hours. The drum before being used is inserted in a lathe and the surface thoroughly polished with chamois leather dipped in benzine. The fingers should never touch the contact surfaces after drum has been cleaned, as the slightest dirt, however light, will have its ill effects on the contacts. As little oil as possible should be used on the motor. The surface of the drum is ground absolutely true and smooth so as to eliminate any friction between the pointer and the surface of the drum and to aid good contact. A narrow strip of chamois leather presses against the contact surfaces of the drum to keep them bright and clean.

As will be noticed from the diagram, the bridge circuit differs somewhat from the ordinary cable duplex.

The receiving condensers are unshunted and the magnetic shunt is applied across the instrument contacts. This is to eliminate earth currents and help the wandering zero. When the pointer moves to the dot (or dash) side, current passes from the

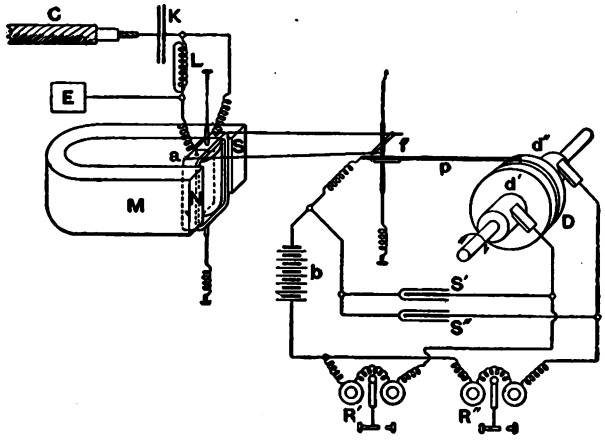

Fig. 11

Brown "Drum" Relay Without Correction Coil Circuit

8-volt split-battery to the polar relay, to the drum and pointer, then to the resistances and magnetic shunts and correction coil circuit; to the direct writer coil and centering plug switch back to battery.

The object of the correction coil and the magnetic shunts is to cure the effects of the wandering zero and lack of definition.

Certain combinations or series of signals of the same polarity have a tendency to fall away toward zero. It is the function of the correction circuit to cure these ill effects. This is accomplished by the correction circuit supplying the correction coil with a slowly built up current so that the effects of the resultant of the main and the correction coil if properly timed produces a straight block signal. The correction shunts and resistances are called L_1,

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L_2 and R_1 and R_2, respectively, and numerous combinations of values can be obtained to meet desired results. The direct writer is used to judge the shape and quality of signals coming from the drum circuit. It is on the same principle as the siphon recorder, only not so delicate, and the siphon rests directly on the moving strip of paper.

The magnetic shunt consists of many turns of insulated copper wire wound over and enclosed in iron laminations, and so connected and brought to terminals that certain values of inductance may be obtained. These shunts have a very high inductive effect and low ohmic resistance and it is due to them that the cable relays have been such a marked success.

A magnetic shunt has a very high resistance to quick impulses while slow currents, like earth currents, pass harmlessly through them.

The signals sent out from the cable relay are known as "Block signals." Certain faults will probably show up when the "correction slip" is being received. For example, if reversals and reversal letters are pinched and weak the coil period is too high, quartz fibers stretched too tightly, coil magnetic shunt too low, or receiving condensers low. If the reversals are the reverse and are heavy pointed and thick the tongue pressure is too great, magnetic shunt too high or receiving condensers too large. A tendency for signals to block up at one side would show correction too strong and R_1 and R_2 would have to be reduced.

The contact points of the drum have resistance around them to improve contact and eliminate sparking.

Many other things have to be considered in adjusting the instrument, such as suspension adjustment, strength of main field, magnet, pressure of

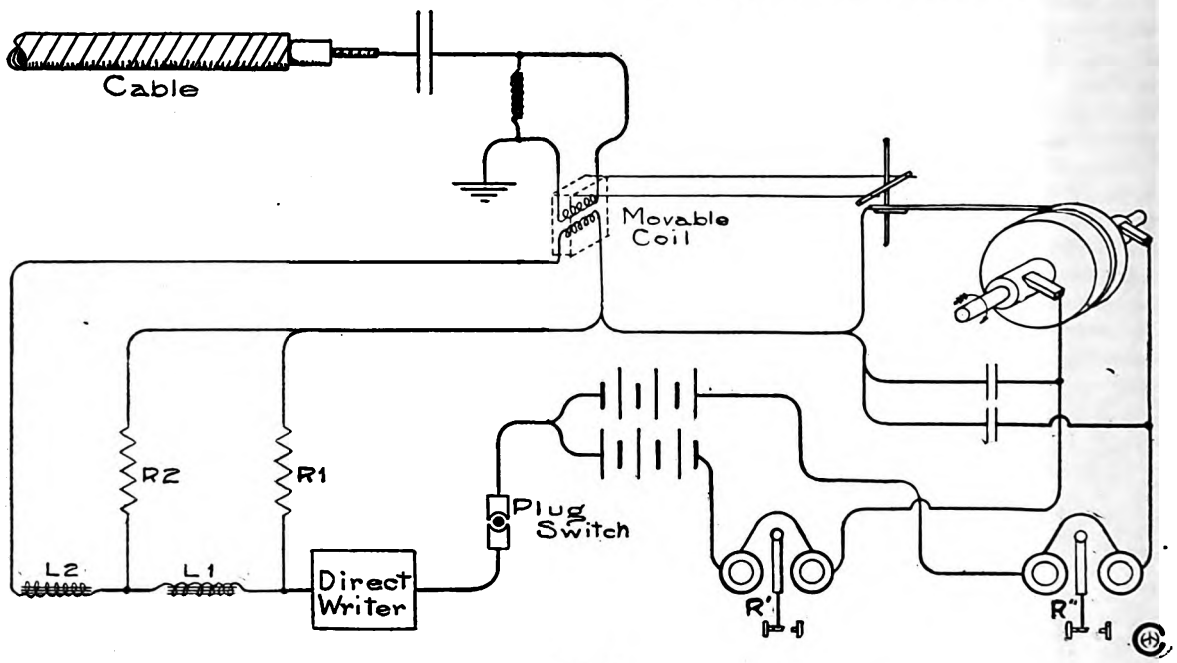

FIG. 12

BROWN "DRUM" RELAY WITH CORRECTION COIL CIRCUIT

The timing of the correction circuit has first to be judged approximately when relay is being installed and the values adjusted so as to get the correct shape of signal.

In lining up the circuit the following signals are generally sent, as all classes of combinations are combined in its composition: "A group of 20 reversals, then 10 E's, 10 T's, 10 ET's, 10 SOS's, Alphabet, five 5's, letter R, five noughts, letter K, She is his sister, Get it right first, Mississippi, Monomotapa, Cancer, Banana. Please prepare all these specimens with same spacing. The quick brown fox jumps right over the lazy dog." There is one centerhole space between letters and three between words.

tongue on drum and suspension control, all of which vary according to the particular cable upon which the relay is being adjusted.

MUIRHEAD GOLD WIRE CABLE RELAY

The magnets and coil suspension of this relay are similar to that of the Muirhead recorder with the exception of the extra correction winding, which is wound over the main line coil. A fine glass siphon tube is attached to the cradle of the suspension and instead of the usual silk fiber which is attached to the siphon and vibrator, by which means the siphon is vibrated, a fine gold wire of about .0015 to .001 inch is used. This gold wire

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acts as the tongue of the relay and the vibration keeps it from sticking to the dot and dash contact pins. It might be well to mention that several inventors tried this method of relay operation before but failed on account of not having a vibrating wire. The vibration is very slight, being hardly perceptible, but nevertheless sufficient to keep the wire from sticking to the contact pins.

The contact pins are made of gold or platinum, which are mounted on suitable insulating material and are so constructed that the pins are adjustable both with regard to their position along the gold wire and the distance from it, so that no-man's land can be varied to suit as occasion arises. This is a very useful adjustment, especially in any balance trouble.

The glass siphon or pointer to which the gold wire is attached varies in diameter according to the speed of the cable worked. The gold wire from the pointer must be attached to the vibrator needle on the same horizontal and vertical plane with the cradle suspension. High speed cables require an additional piece of siphon tube to strengthen the pointer and increase period of siphon longitudinally. This addition is called "the strut." The working tension of the gold wire should be such as to slightly curve the pointer, and the gold wire must be straight without kinks. The point of contact on the gold wire is less than half way from the still end of the wire. This improves the contact by a certain amount of "lapping," which is essential to good contact.

The coil magnets have adjustable pole pieces and also are provided with a winding of magnet wire so that the strength of the magnets, if necessary, can be boosted.

The position which the relay occupies in the cable duplex circuit is similar to that of the Brown relay shown in the description of that relay.

The method of using unshunted receiving condensers and a magnetic shunt across the relay terminals practically eliminates earth currents, and so helps to keep the zero straight.

The "gold wire" relay is very flexible and easily operated. A good feature of this relay is the rapidity with which dirty contacts can be remedied by substituting new positions on the contact pins or along the gold wire, also the variation of the distance of no-man's land to suit occasions mentioned above.

The current worked from the gold wire contacts varies from 2 to 5 milliamperes. The gold wire relay operates another relay known as the stretched wire relay, so named because of the stretched platinum wire which acts similarly to that of the gold wire in the gold wire relay, but it is not in a state of vibration. This relay is not as sensitive as the gold wire, although the principle of construction is the same. The stretched wire relay operates the sending-on relays which transmit the main line current to the cable.

The most important feature of the gold wire relay is the vibration of the gold wire, which vibration is hardly perceptible. The correction circuit can also be applied to this type of relay.

The Bruce Cable Relay

The Bruce relay is similar to the Brown, so far as the magnets and coil suspension are concerned. The contact feature of the Bruce is entirely different from any other. The pointer, which is made of a fine nickel wire, is attached to a thin strip of phosphor-bronze and forms one unit. This unit is attached to the cradle of the intermediate suspension piece. This pointer is kept in a state of perpetual vibration by means of a vibrator of the fork type which controls the vibrating current to a coil situated underneath the pointer, and also acts as the position and receptacle for the contact block. The contact block is made up principally of nickel separated by a thin insulation of hard rubber, which acts as no-man's land. This position is not adjustable. The nickel parts of the block either side of the insulation have insertions of small rectangular portions of silver and upon these silver portions are inserted small amounts of mercury which lie in a rectangular shape on the silver portions. The mercury having affinity for the silver and not the nickel, is the secret of this. These mercury positions form the dot and dash contacts.

The vibrating pointer acts as the tongue of the relay and moves into the mercury globules either side of no-man's land. One important feature of the operation is that it depends upon the correct vibration of the pointer, which is always kept at maximum amplitude.

The correction circuit for correcting the wandering zero can also be applied to this relay. The field magnets can be boosted, if necessary, and for this purpose are wound with magnet wire.

(To be continued)

In Costa Rica a Presidential decree dated April 10, 1920, declares radio telegraphy and telephony to be a monopoly of the State. According to the decree, concessions to operate radio service may be obtained for a limited time under contract, with the approval of the President. The establishment, management and operation of these services will be conceded only to native Costa Ricans, individually, or as a corporation, and under the direction and protection of the State.

In Salvador, according to a recent memorandum published by the government in regard to telegraph and telephone lines, there are 2,132 kilometers of telephone lines and 3,793 kilometers of telegraph lines.

In Paraguay, during the year 1919, telegraph offices to the number of thirteen were established, making the total number of offices now in operation sixty-one.

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AT THE NATIONAL CONVENTIONS

"Loud Speakers" in Chicago Coloseum Bring Voices of Speakers at National Convention to Every Person in Audience.

For the first time in many years the attendance at the Republican National Convention was not too large to hear the speaker's voice. Not that the crowds were any less in number or that they were jammed any closer together, but the voice of each speaker was made loud enough for every one to hear, by means of a new and remarkable invention, the latest development of the loud speaking telephone.

The long arm of electricty has conveyed the force of falling water miles away to push a thousand heavily loaded street cars. It has transmitted the stored heat and light of coal into a million homes and factories. It has faithfully carried the faint voice of a child across the continent, so now it wraps its strength around the voice of the orator and gives it power and volume to reach the distant auditor with all its expressions and its timbre intact.

National conventions have depended more on visual rather than audible interest. There has, of course, been a chorus of applause which all could hear, but much of what has been said, was read rather than heard even by those who were present.

Just in time for the Republican convention the engineers of the Bell Telephone System successfully completed a voice-magnifying apparatus embodying newly discovered features of telephony, which the inventor of the telephone could not have foreseen.

The Master Magician

In the Coloseum's vast auditorium the experts of the American Telephone and Telegraph Company, the Western Electric Company, and the Chicago Telephone Company worked for ten days previous to the opening of the convention, installing the intricate apparatus through which electricity, the master magician, could serve clear and distinct sound to the occupants of the most distant seats Without seeing how it was done, the audience found that as far as hearing was concerned, the great crowd had been telescoped by the public address system into close proximity to the speaker's platform. Under the floor and behind the walls of the Coloseum ran the wires which led to and from the speech-magnifying apparatus, itself hidden away in an unseen part of the building. The voice of Mrs. Douglas Robinson, sister of the late Colonel Roosevelt, could be heard by those who were so far away that they could not recognize her.

Although this invention is unlike any of the previous attempts to solve the problem of speech magnification, it is not spectacular in appearance, and like telephone plants in general, it accomplishes its great results from behind the scenes.

Speech electrified in one way can be sent for thousands of miles along a wire. If electrified in another way it can be hurled through ether across continents and oceans. Again electrified in another way it can be discharged from a receiver horn with such power that it will travel through the air as the natural sounds travel, but to a much greater distance and in a manner to dominate other sounds.

The loud speaking telephone system which the Bell System placed in the Coloseum at Chicago and at the San Francisco convention also, has been in process of development for about ten years.

The experiments have been numerous and of great scientific interest, but there has also been a romantic side to the work, which was mostly done in the laboratories of the Bell System, situated on one of the busiest and noisiest waterfront streets in New York City.

One foggy night a little group of Bell telephone engineers crossed the Hudson River and from the roof of the Lackawanna Station listened while the same rhythmic counting used in the tests at West Street, came weirdly out of the mist.

But the test which counted most was the vocalizing, for a vast outdoor audience in the New Jersey Velodrome, the judges' announcements of the bicycle races.

There have been various demonstrations of earlier apparatus, but beyond the tests necessary to assure complete success, the demonstration at Chicago was unprecedented in the history of the world.

How it is Done

Briefly described, in its latest development as used at the national convention, the voice-amplification and reproduction is produced in this way: A few feet in front of the speaker and several feet from the floor is mounted or suspended a small wooden box, perhaps six inches on a side, with the front open toward the speaker. This box is lined with heavy felt and in it, suspended by rubber bands, is the transmitter. This is an instrument designed both for extreme sensitiveness and for ab-

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sence of distortion in the transformation from sound to electrical energy.

The mouthpiece found on the ordinary transmitter is omitted and the diaphragm is stretched under high tension, to prevent any marked resonances in the range of frequencies necessary for voice reproduction. This transmitter is supplied with direct current in a local battery circuit and regulated by a potentiometer.

The high frequency voice energy generated by the transmitter is fed to the input or grid side of the first vacuum tube amplifier.

Voice Not Distorted

This process may be repeated a number of times as in the present case, where the output of one stage of amplification is used to control the power in the next.

The output of the final stage of amplification, the third in this case, is almost an exact reproduction of the original source but of very greatly increased power. It is possible, with the system in question, for example, to obtain an amplification of several million times without any appreciable distortion of the original wave form.

Having thus taken the original voice energy and by means of the transmitter changed it to electrical energy, and amplified this by means of the vacuum amplifier tubes, it is necessary to transform it to voice energy again, still without distortion.

This is accomplished by the loud speaking receiver, in which is expended the power derived from the last stage of amplification. The design and detail of this receiver is very different from the ordinary hand telephone receiver, but in principle it is the same.

Like One Voice

To each loud speaking receiver is connected a horn which spreads and directs the resulting sound waves. These receivers and horns are mounted twenty odd feet above the head of the speaker, pointing in various directions so as to cover the audience.

The mouths of the horns are depressed just enough so that the audience near at hand within range of the speaker's voice direct, hear very little from the horn, while those further away hear both the speaker and the loud speaking system, those further away hearing the horn only.

It might seem at first glance as if this additional source of sound some distance from the speaker would create an unnatural effect, but this is not the case. The sound as it issues from the horn is exactly in phase with the speech, and of very nearly exactly the same quality. Furthermore, the only part of the audience to hear the receiver to any great extent is some distance from the speaker, and the angle between the speaker and the source of sound is small enough so that it is practically impossible to tell that one is not listening to the speaker himself.

A Few of the Problems

One serious problem was met in this connection. A sensitive transmitter, designed to pick up ordinary conversational tones within a radius of several feet, was placed, of necessity, within some twenty feet of a receiver and horn giving out sounds audible for many hundreds of feet. Obviously the danger of this system starting to "howl" just as the ordinary telephone set howls when the receiver is held directly against the transmitter, was very great. It took some careful study to determine the best relative positions for transmitter and receiver, the best shape for the horn, and a satisfactory method for mounting and shielding the transmitter, so that practically no sounds from the receiver or room vibrations would be picked up by the transmitter, while the latter would still be sensitive to the voice of a speaker several feet distant.

This meant that the sound issuing from the receiver had to be limited in its dispersion vertically so as not to get back to the transmitter. At the same time it was necessary to distribute the sound horizontally as much as possible without distortion, so as to cover the audience.

Both these objects were accomplished satisfactorily with the horn and location of apparatus finally adopted, and it is now possible, by the use of several receivers and horns situated over his head, for a speaker to address an audience on all sides of him within a radius of several hundred feet and to convey to them every syllable and every inflection and emphasis, with perfect naturalness and articulation, without any danger of the sound amplifying system itself interfering by starting to howl.

Voice Reproduction Almost Perfect

How good the reproduction of the voice is may be judged by an interesting fact noted during the process of development. If an observer several hundred feet away walks in toward the speaker, it is almost impossible, although he is listening carefully, for him to tell at what point he ceases listening to the loud speaking system and starts listening to the speaker directly.

One man was heard to declare that of the nine conventions that he had attended this most recent one was the most remarkable, in that he was able to hear the speakers so distinctly. Will Hays, chairman, characterized it as "a perfectly fine arrangement," and Murray Crane called it "excellent."

As an example of service, let us tell this little incident: On Wednesday evening the telephone people learned that some of the press people could not hear distinctly. At 5 p. m. the Western Electric Company was asked to prepare two more loud speakers, and at 6 o'clock Thursday morning they were delivered. At ten o'clock they were installed and in operation, so that everybody could hear.

During the war, the loud speaking telephone was adapted by the Bell System engineers to several different classes of military service. On battleships such telephones were developed for transmitting orders. On the submarine chasers the loud speaking system of telephone was extensively used in connection with the radio equipment and in detecting enemy submarines.—*Telephone Review*, N. Y.

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SUBMARINE CABLES

THE ALASKA CABLES

In connection with cable transmission experiments under way during the past few years, references have been made to the conductors and insulation make-up of the United States Signal Corps cables laid in the Pacific between Seattle, Wash., and Alaska. These cables were made by American manufacturers.

The first section—that between Seattle and Sitka —1,070 miles in length, was laid at an average depth of 1,000 fathoms and an extreme depth of 1,700 fathoms. The laying of the cable was completed on August 24, 1904, under the direction of Major Edgar Russel (later Brigadier General Russel). The Sitka-Valdes section is 650 miles in length and was completed in October, 1905.

The conductor was made up of seven strands of No. 21 B. & S. gage best soft Lake copper, conductivity not less than 98 per cent. pure copper. The insulation and armor consisted of one layer of pure Para rubber one-sixty-fourth inch thick; a layer of insulating compound containing not less than 40 per cent. of pure Para rubber, nine thirty-seconds inch thick; a layer of cloth tape saturated with rubber compound put on with double lap; a serving of jute yarn steeped in clutch; sixteen No. 9 B. & S. gage galvanized steel armor wires with a lay of from nine to ten inches. The completed cable was run through a hot asphalt compound, served with Calcutta jute; run through hot asphalt again and served with Calcutta jute in reverse direction to the first; again treated with asphalt and, finally, run through lime or soapstone to prevent sticking.

The Seattle-Sitka section has a diameter of eight-tenths of an inch in the deep sea line. The shore end diameter is one and one-half inches. The weight of the deep sea section per mile is 3,000 pounds; intermediate section, 6,000 pounds, and shore end 18,000 pounds per mile. The resistance of the copper conductor per mile is 7.4 ohms; the insulation resistance 3,000 megohms per mile; the capacity per mile, one-half microfarad; ratio of copper resistance to insulation resistance 1 to 440, or less than one-quarter of one per cent.

The specifications for the cable contemplated a speed of thirty words per minute.

International Communications Conference

The international communications conference, called under the auspices of the League of Nations, will be held in Washington on September 15.

Delegates from the Allied and associated powers, including Great Britain, France, Italy, Japan and the United States, are entitled to representation. Delegates from Japan already have arrived.

The principal business of the conference is expected to concern the allocation among the Allied and associated powers of the German cables confiscated during the war.

European Communications Conference

The League of Nations was represented, together with various specialists from different States, at the conference which has just completed its work in Paris for the re-establishment of postal, telegraphic and wireless communication in Europe. The council was called by the French Government on the initiative of the communications section of the Supreme Economic Council. A series of proposals was adopted and will be submitted to the governments concerned, their object being to promote an improvement as rapidly as possible in areas which are outside the ordinary scope of the Postal and Telegraphic Convention, but which are at the same time vital for quick and sure communication between different countries. In order to arrange further meetings to carry out this work, the conference decided to invite the communication and transit section of the League of Nations to take charge of the arrangements for further meetings in collaboration with the postal, telegraphic and wireless administrations of the various countries.

Imperial Press Conference Considers Cable Subsidies

At the opening session of the Imperial Press Conference, August 5, at Ottawa, Ont., a resolution was presented urging government subsidy of cable lines and lower cable rates to insure the fullest interchange of news and opinion within the British empire.

British and Canadian delegates strongly opposed acceptance of any government subsidies which might imply government control of the character of news services.

A resolution to be considered will ask that governments of the British Empire adopt adequate wireless services throughout the empire, by public and private enterprise. Another will set forth that the "conference is strongly of the opinion that the principles should be immediately established for providing the British and the world with the advantages of wireless telegraphic and telephonic communication."

THE ALL AMERICA CABLES COMPANY has completed the laying of a cable between Cartagena, Colombia and Colon, Panama, a distance of 310 miles.

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Radio Telegraphy

Radio Corporation of America

E. J. NALLY, president, was last heard from when leaving Berlin, Germany, for Christiania, Norway. He is expected home early in September.

E. B. PILLSBURY, general superintendent, and W. A. WINTERBOTTOM, traffic manager, were official visitors in Boston, Mass., recently.

DAVID SARNOFF, commercial manager, and LEE LEMON, assistant to the president, are in Chicago on official business.

JOHN J. LEARY, of the British Marconi Company, was a recent New York visitor.

T. M. STEVENS, superintendent of the Southern Division, Baltimore, Md., is temporarily located at headquarters, New York.

G. W. NICHOLLS, superintendent, Boston, is receiving congratulations upon the arrival of a son.

THE MARCONI WIRELESS TELEGRAPH COMPANY of Canada reports a net profit for the year 1919 of $102,130, which increases the company's surplus to $395,918.

MR. AND MRS. FREDERIC HALSTED HAHN are receiving congratulations on the birth of a son, Frederic Halsted, Junior, on August 7th, at Ossining-on-the-Hudson, N. Y. Mrs. Hahn is the daughter of Edward J. Nally, president of the Radio Corporation of America.

ON AUGUST 1, the Radio Corporation of America took over from the Navy Department, at Chatham, Mass., the operation of the German radio circuit.

C. J. WEAVER has been appointed assistant superintendent of the New York office at No. 64 Broad Street. W. Leslie and R. Butler, operators, have been added to the staff.

J. F. MAKESCA has been appointed supervisor at the high-power station, Chatham, Mass. J. E. Brady and F. J. Flood, operators, have joined the Chatham staff.

G. J. Eshelman has been promoted to be engineer in charge of the station at New Brunswick, N. J. Mr. Jordan is assistant engineer.

H. A. OXENHAM, heretofore of the Lakewood, N. J., station, has been appointed superintendent of the station at Koko Head, H. T.

L. A. BRIGGS has been appointed acting assistant superintendent of the station at Lakewood, N. J., vice Mr. Oxenham.

THE NEW CITY OFFICE at San Francisco is located at 300 California Street. Duplex Morse circuits connect the office with the high-power station at Marshall, Cal. A. A. Isbell is general superintendent; G. E. Baxter, city superintendent; R. A. Malcolm, cashier; G. F. Shecklen, solicitor; J. Hauselt and C. M. Jackson, operators, and W. M. Conway, bookkeeper. In addition there is a staff of abstract clerks; delivery and receiving clerks, and stenographers.

THE STATION at Koko Head, H. T., is being regularly operated duplex both with San Francisco, Cal., and Japan.

DONALD G. WARD is attached to the New York office in charge of office and ship records.

United States Civil Service Examination—Radio Operator

The United States Civil Service Commission announces an open competitive examination for radio operator. Vacancies in the Lighthouse Service at salaries ranging from $960 to $1,200 a year, with $1 per diem additional for subsistence, and in positions requiring similar qualifications throughout the United States, at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

Appointees whose services are satisfactory may be allowed the increase granted by Congress of $20 a month.

Automatic Radio Telegraph Transmitter

There has been brought out in England an automatic transmitter for radio telegraph working by means of which any one of sixty prearranged messages may be transmitted simply by pulling a lever and releasing same. The instrument is intended for use on shipboard or aircraft, where no operator is available.

IN CHILE, according to statistics for the year 1919, the thirty-two wireless telegraph stations of the country received official messages aggregating 599,810 words, and private messages aggregating 792,320 words. The number of official messages sent aggregated 537,190 words, and private messages 781,040 words. The President of Chile has promulgated a new postal and telegraph law which provides for the fusion of these two services. The law places the postal, telegraph and telephone services in charge of a general bureau under the direction of a director-general and an assistant director-general appointed by the President.

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French Plans for Extensive Wireless System

A dispatch from Paris says that Under Secretary of State for the Post, Telegraph and Telephone Services Deschamps has announced that the French Government plans for an elaborate wireless system whose center will be in Paris and which will cover Europe, Asia, Africa, and South America and connect with North America. If this system, part of which is already in existence, is integrally applied as now proposed, France's wireless communications throughout the world will be able to rival with Great Britain's cable communications. According to the details made public by M. Deschamps at a recent meeting at Rennes, wireless communication was established with Hungary May 20, 1920, and will soon be opened with Belgrade. For commercial communication with the United States there is to be a station at Doua, near Lyons, in addition to that in construction at Croix d'Hins, near Bordeaux. Between France and its colonies there will be stations with a range of 7,500 miles at Saigon and at Tahiti. Stations with a radius of at least 4,375 miles will be established at Djibouti, Tananarive, Noumea, and French Martinique, also secondary stations at Pondichery and French Guiana. In Africa the system will include stations at Saida and Bamako, which will take care of the traffic between Paris, Algeria and West Africa; another station in Senegal, near Dakar, and finally that of Brazzaville. The stations of Saida, Bamako, Brazzaville, Tananarive, and Saigon are in course of construction.

Chinese Government Wireless Station Opened

Announcements have appeared that the government wireless station at the Temple of Heaven, Peking, is open for service, and that all telegraph offices in the city will accept radiotelegrams at the same rates as those charged for land-line messages for transmission to Kalgan, Wuchang, Woosung, Shanghai, and Foochow. Special rates apply to radiotelegrams sent to ship and aviation stations, and such messages are accepted only by the central office.

This service gives Peking improved communication with some of the most important commercial centers in China. Kalgan, Chihli Province, handles much Mongolian trade; Wuchang, Hupeh Province, is one of the Wuhan cities (the others being Hankow and Hanyang), which have a combined population of about 1,500,000; Woosung is in Kiangsu Province, 15 miles from Shanghai, where the larger ocean steamers anchor; Shanghai is the leading port of China; Foochow, Fukien Province, has a large export trade in tea. It is reported that a wireless station will be established at Urga, Mongolia, during the present year.

In Ecuador a radio telegraph station was opened recently at Quito for communication with a station at the port of Guayaquil.

Joe Salav—American

The accompanying photographic reproduction is of Joe Salav, who was born in Bohemia on September 28, 1905, and who at nine years of age came to America—not to grow long hair and make soap-box speeches, but to find a place out in the open where he could learn a trade and become a useful citizen. While learning to speak the American language Joe worked at odd jobs during which time he

Joe Salav

practiced reading and writing. A year or so ago he entered the service of the Western Union Telegraph Company at Owosso, Mich., as messenger boy and at once took up the study of telegraphy, where, under the guidance of Manager Beckwith he has become one of the best fourteen-year-old Morse operators in the country. The boy has continued at school, and this fall will enter high school. His ambition is to become a good American citizen and to work his way upward in the telegraph service.

Radio Station on Mount of Olives

A report from London states that a radio telegraph station is to be erected on the Mount of Olives, in Palestine, equipped with apparatus capable of communicating with Paris and London.

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Canadian Telegraph Items

GEORGE FLANNERY, in charge of the telegraph service of Bongard, Ryerson & Company, Toronto, Ont., was a New York visitor during the last week of July. While here he called on a number of former associates, including J. Frank Howell, and D. A. Mahoney. Mr. Flannery returned to Toronto by way of Niagara Falls, being joined at the latter place by his family for the boat trip across Lake Ontario.

G. F. BARLOW, of the automatic department, Great North Western Telegraph Company, Toronto, Ont., was a New York visitor on August 6.

THE BOARD OF CONCILIATION appointed to deal with the telegraphers' wage questions in the Canadian Pacific Railway Company's service consists of R. D. Gunn, county judge, Ottawa, Ont., chairman; F. H. Phippen, K. C., Toronto, representing the company, and J. T. Gunn, Toronto, Ont., representing the employees. The telegraphers have applied for a 25 per cent. increase in wages.

J. B. COLBOURNE, manager, Western Union Telegraph Company, North Sydney, N. S., has resigned to accept a place in the service of the Canadian Pacific Railroad Company's Telegraphs at Calgary, Alberta. Upon leaving for the west Mr. Colbourne was presented by his associates with a gold watch and chain as a token of remembrance. He is succeeded at North Sydney by L. Black, who has been in Western Union service for a number of years.

THE BOARD OF ARBITRATION, appointed to consider the wage question of telegraphers, printer attendants and clerks, employed in the service of the Canadian Pacific Railway Company's Telegraphs, on August 6 announced that an agreement had been signed by the company and the employees' representatives providing for salary increases to Morse operators ranging from $17 to $20 per month; printer operators, $10 per month, and clerks from $5 to $12.50 per month.

RUDOLPH A. BOYLE, fifty-seven years of age, for many years employed as telegrapher in the Montreal office of the Canadian Pacific Railway Company's Telegraphs, died of heart disease in that city on August 6. Mr. Boyle had worked in Calgary, Alberta, and in Boston, Mass., and was well known by telegraphers in all parts of the country.

OLD-TIMERS' CONVENTION AT TORONTO

There can be but few persons throughout the length and breadth of the American continent who have not heard of the Canadian National Exhibition, held annually at Toronto, for that exhibition is at once the oldest and the greatest of all annual exhibitions. There is, indeed, nothing like it anywhere else in all the world. The Canadian National Exhibition has now been held every year without interruption for forty-two years, and has grown with the years until today it covers an area of 264 acres, stretching one and one-half miles along Lake Ontario, and comprises seventy permanent buildings, valued at $3,000,000 and containing 750,000 feet of exhibit space and is visited during the two weeks it is open by 1,200,000 persons, 200,000 of whom come from the United States.

The facts given above speak for themselves, but aside from this it is in every way natural that the Canadian National Exhibition should be unapproached, for not only are exhibits and government displays from all parts of the world to be seen there, but associated with it are the second largest dog show in America, the largest trap-shooting contest on the continent, the biggest live-stock and poultry show; a national auto show, and other special attractions which give it a place all its own among exhibitions.

The other special attractions, it may be mentioned, include a Midway, where the largest carnival combination in the world furnishes a mile of unadulterated enjoyment, and a mile track on which horse, cycle or auto races are held daily.

Chief among the exhibition buildings is a fireproof grandstand, 725 feet long, which seats 16,800 persons, and has standing room for 8,000 more while in front of it is an outdoor stage 700 feet long, where 1,500 performers appear in nightly spectacle.

The dates set for this year's exhibition are August 28 to September 11, inclusive, and by a happy chance the annual reunion of the Old Time Telegraphers' and Historical Association, in conjunction with that of the United States Military Telegraphers' Association, will be held in Toronto at the same time, the dates being August 31 and September 1 and 2. There are, of course, many old-time telegraphers who endeavor never to miss the annual reunion, and who are certain to attend the approaching reunion if they can manage it at all; but with the wonders of the Canadian National Exhibition as a further incentive, many others who have not so far connected themselves with the O. T.

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T. & H. A., no doubt will hasten to send in their applications, so as to participate in the trip to Toronto. At any rate, word comes from that city that the committee in charge of the entertainment arrangements have made provision for giving visiting members and their ladies full opportunity to see the Canadian National Exhibition and all it has to offer in the way of information, pleasure and amusement. On to Toronto, therefore, all ye old-timers!

HENRY B. McINTYRE

Inspector, Canadian Pacific Railway Company's Telegraphs, Vancouver, B. C.

Mr. McIntyre was born near St. Thomas, Ontario, in the year 1863, and began his telegraph career with the Great North Western Telegraph Company at Mitchell, Ont., while still a young man. After seeing service with that company at various points he entered the service of the Canadian Pacific Railway Company at Winnipeg, Man., in the year 1888, and has been with that company continuously during the past thirty-two years.

HENRY B. MCINTYRE

In his early work Mr. McIntyre gained a reputation for careful, painstaking application to duty. While working as a telegrapher he took up the study of electricity as applied to telegraphy, and also devoted time to mastering the details of line construction. In due time he was appointed inspector of telegraphs in British Columbia territory, where line maintenance through the mountain country calls for the exercise of a high grade of ingenuity and of resourcefulness. His official superiors regard Mr. McIntyre as one of the most successful telegraph engineers in overcoming unusual difficulties in line construction and line maintenance.

Special Post-Graduate Training for Technical Men

Arrangements have been completed by the educational authorities of the Western Electric Company and the faculty of Columbia University to enable employees of the former to carry on post-graduate courses coincident with their regular duties. This system has been limited to the members of the engineering department, where more than three thousand technical students are eligible to take advantage of the offer. Approved graduates of colleges and scientific schools may pursue graduate work for masters' degrees and fulfill the requirements in two calendar years.

The hours of the work in the engineering department of the Western Electric Company have been especially arranged to provide those who attend the classes at Columbia with full opportunity for study. The salaries of such students are adjusted to the individual circumstances and meet all living and tuition charges. Admission is dependent on an adequate grounding in mathematics and physics. After the candidates are nominated by the officials of their departments they must meet the academic qualifications of the University. Several of the more qualified employees have been permitted to undertake work for a doctorate at Columbia.

A special course of training in technical work has also been started by the company itself to instruct graduates of arts colleges in its engineering methods. A month is set aside by the educational authorities for ground work, and after that activity is started in the laboratories. The entire course takes nine months. Outside reading and lectures are required during that period.

Relief for Overworked "Central"

A far-reaching public service rendered by the Schenectady Chapter of the American Red Cross, which, incidentally, relieved the congestion at telegraph and telephone offices that always accompanies a public catastrophe, was performed recently through the staff of the Home Service Section.

In the early part of the summer, a disastrous railroad wreck occurred on one of the principal lines entering the city. Newspaper accounts blazoned the accident throughout the country, spreading panic among all whose dear ones had been passengers on the trains due in Schenectady at the hour of the wreck. The personnel of the Home Service Section was mobilized and instructed to handle all incoming telephone and telegraph inquiries from persons who had relatives or friends on the train. Visits were made to the temporary morgues and hospitals and all possible information regarding the names, residences, extent of injuries, etc., collated and sent on to these anxious ones.

The devoted workers stuck to their tasks as long as the inquiries continued to come in.

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Student's Course in Technical Telegraphy

The Students' Course in Technical Telegraphy was started in the March 16 issue of THE TELEGRAPH AND TELEPHONE AGE. Ten lessons have been presented so far, each lesson dealing with a separate division of the general subject. In addition to the regular readers of this journal who are following the instruction, more than three hundred new readers started their subscriptions to begin with the issue containing Lesson No. 1.

These new students of telegraphy are scattered all over the United States and Canada, and judging from the number of questions we have answered, and the calls we have received for additional circuit sketches and other detail information, it is safe to say that the Course as presented is one of the most popular elementary courses ever submitted through a periodical publication.

It may here be stated that it is the present intention to continue the semi-monthly instalments of instruction until subjects are covered, including duplexes, quadruplexes, wire testing and repeaters, with all that is involved in a working knowledge of these systems and practices.

As previously announced, after the tenth Lesson was submitted, a set of examination questions is now presented to the students who have followed the papers. The questions are based exclusively upon the instruction papers as published.

Every reader of TELEGRAPH AND TELEPHONE AGE may enter this examination by answering the following questions.

The answers to questions must be written on white paper, with pen and ink. The questions must be answered in the order submitted. The name and address of the student must be written on the top of the first sheet.

In case the student is unable to answer one or more of the questions, the sheets containing answers to other questions should so state; but it is recommended that an attempt be made to answer all questions.

The names of all students who receive markings above 50 per cent. will be published, unless the student requests that his name be omitted from publication.

EXAMINATION QUESTIONS

1 Draw a diagram showing five cells of battery connected in series.

2 What is meant by "multiple connection"?

3 Are "shunt" and "multiple" connections the same? If not, what is the difference?

4 Where a large number of telegraph sounders are in use, what is the object in connecting them in multiple?

5 Explain what is meant by "grounded circuit," and "loop circuit."

6 If a direct current generator yielding 20 volts is connected to a 40-ohm telegraph sounder, what will be the current strength in amperes flowing through the coils of the sounder?

7 If four telegraph relays, each of 150 ohms resistance are connected in series by means of short wires of negligible resistance, what voltage would be required to supply the relays with a current of fifty milliamperes?

8 If 110-volt pressure is available to operate a 10-ohm telegraph sounder—the sounder requiring one-fourth ampere current—what would be the resistance in ohms of the resistance unit inserted in series with the sounder to keep the current strength down to one-fourth ampere?

9 What is the difference between "multiple" and "multiple series" connections?

10 Why are the electromagnets of telegraph sounders and relays so made that the ends of the cores facing the armature of the instrument do not touch each other?

11 Referring to Fig. 16 of Lesson No. 6: What is the purpose of the resistance coils shown

S. O. S!

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in the upper right hand corner of the Figure?

12 Why is it advisable not to use in telegraph work voltages higher than 400 volts?

13 Draw a diagram of a telegraph relay, key, main battery, sounder, and local battery. See Fig. 18, Lesson No. 7.

14 What is a satisfactory amount of current in milliamperes for a telegraph circuit in which 150-ohm relays are connected?

15 What is the wattage output of a generator yielding 60 volts and a current of two amperes?

16 If a generator is marked as having a wattage of one-half kilowatt, and yields 150 volts; how much current in amperes will it supply?

17 Draw a diagram of four two-contact pinjacks connected in series.

18 Draw a diagram of three two-contact pinjacks connected in multiple.

19 What is the difference between a "wedge" and a "plug" as used in connection with conducting cords in switchboards?

20 Is the plug attached to a two-conductor cord the same as the plug attached to a single conductor cord? What is the difference?

Answers to these questions should be sent to the editor of TELEGRAPH AND TELEPHONE AGE before September 15, 1920.

Neatness of diagrams called for will be an important factor in determining points.

Your Money's Worth

One would have a hard job finding anything of use which today sells for the same price it sold for before the war. Everything that goes into manufacture and production of any sort has increased in cost 100 per cent. or more. TELEGRAPH AND TELEPHONE AGE, however, is not only still selling at pre-war figures (two dollars per year), but it is a more useful journal today than ever before. If the reader is not a regular subscriber he should lose no time in sending in his name while the present low subscription rate remains in force.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

And we can highly recommend it to our readers

$2.50 per copy

From TELEGRAPH AND TELEPHONE AGE

253 Broadway, New York

NEW CABLE BOAT

For Use in Long Island Waters by the New York Telephone Company

The old Long Island cable boat, "Blue Bell," has been consigned to the scrap heap, and the new "Blue Bell" has taken its place.

The old boat was constructed for the purpose of transporting material in connection with laying a subway across the marshy lands of Jamaica Bay to the Rockaway Peninsula. It also carried reels of cable and loading pots for use in this subway as well as laying short stretches of submarine cable across the numerous waterways that cut through the marshy lands.

This work and the rehabilitating of the coast guard submarine cables along the entire coast of Long Island during the war wore out the boat completely.

The new cable boat is built along the lines of the old boat, but is larger, and the hull is of much better material, so that it will last for many years. It will be used for laying a second cable across Jamaica Bay, planned for the coming year, as well as for general submarine cable work and water transportation in the numerous bays and inlets in the division.

The design of the boat is unique in many respects. The propeller does not project below the bottom of the hull, but is in a trough which protects it from any damage and permits navigation in the shallowest of waters. The bow is so shaped that the boat can run well up on shore to permit the rolling of reels of cable and at the same time very little buoyancy has been sacrificed.

The new "Blue Bell" will carry 15 tons, and when loaded will have a draught of but 2 feet. It is 40 feet long and 11 feet wide, and has a speed of seven miles an hour.

Expansion of French Telephone System and Railway Electrification

Opportunity for American manufacturers of telephone apparatus and equipment to secure a market for their product in France is seen in the forecast of the elaborate program of telephone development and expansion planned by the French Government because of the inadequacy of the existing telephone resources to serve in taking the necessary part in the economic progress of the country. In comparison with other European countries, France ranks eighth in number of telephone subscribers, having 354,155 on January 1, 1918, or 9 to each 1,000 inhabitants, while Germany at that time was reported to have had 1,421,000 and Great Britain 812,000, or 22 and 18 per 1,000 inhabitants, respectively. The proportion of the population who possess telephones in some of the smaller European States is understood to be considerably greater than in the countries named.

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And the man in charge of those batteries says that the transmission is always clear and remains uniform at all times.

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THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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THE RAILROAD
TELEGRAPH AND TELEPHONE

J. F. CASKEY, superintendent of telegraph, Lehigh Valley Railroad, South Bethlehem, Pa., chairman of the Telegraph and Telephone Division of the American Railroad Association, was a New York business visitor on August 11.

H. HULATT, manager of telegraphs, Grand Trunk and Grand Trunk Pacific Railroads, Montreal, Que., first vice-chairman, Telegraph and Telephone Division, American Railroad Association, was a New York official visitor on August 11.

C. A. PLUMLY, superintendent of telegraph, Baltimore and Ohio Railroad, announces the appointment of W. H. Curtis as general foreman, with headquarters at Newark, Ohio, vice C. L. Hewitt, assigned to other duties. Also, the jurisdiction of C. M. Kochensperger, general foreman at Cincinnati, Ohio, has been extended to include the Toledo Division of the company's lines.

E. G. STRADLING, recently appointed superintendent of telegraph and signals of the Chicago, Indianapolis and Louisville Railroad, with headquarters at Lafayette, Ind., was born at Indianapolis, Ind., on September 5, 1880. Mr. Stradling's entire experience has been in the service of the C., I. & L. Ry., where, since 1908 until his recent promotion, he has been signal engineer.

THE BALTIMORE AND OHIO RAILROAD COMPANY is conducting a try-out of the printing telegraph system invented by Dr. L. M. Potts of Baltimore, Md. The instruments are installed on a 180-mile circuit between Baltimore and Cumberland, Md.

THE ERIE RAILROAD MAGAZINE recently conducted a Telegraphers' Penmanship Contest for telegraphers in the service of that company. The prize awarded the writer of the winning "hand" was a standard semi-automatic sending machine. The three top-notchers among the contestants were Jess H. Roy, Edward J. Crowley and E. H. Van Patton. Mr. Roy is a dispatcher in the Rochester, N. Y., office. Other entrants who submitted beautiful specimens of telegraphers' penmanship were: B. T. Reder, Hammond, Ind.; C. J. Kitchen, Stroudsburg, Pa.; L. J. Acker, Mountain View, N. J., and C. W. Vincent, Hornell, N. Y.

J. F. SLACK, well-known railroad and commercial wire chief, and who has been laid up for some time on account of physical disability, is reported recovering satisfactorily. His present address is Box 663, Sweetwater, Tex.

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Railroad Telegraph Superintendents' Convention

Telegraph and Telephone Division, American Railroad Association, to meet in Winnipeg, Man., September 22, 23 and 24.

The convention of the Telegraph and Telephone Division of the American Railroad Association, which is to be held in Winnipeg, Man., on September 22, 23 and 24, 1920, promises to be a well attended and important gathering of the telegraph executives of American and Canadian railroads. The various technical committees of the Division have been at work during the past three or four years on reports and specifications which have now been brought to a point of development where their application to every-day service requirements is practicable. Several of these reports are to be discussed and presented for ratification at the Winnipeg meeting.

The first day's session will convene at 10 a. m., September 22.

The reports of the following committees will be presented:

Committee of Direction (Business transacted since last session).

Special Committee on Future Activities.

Committee No. 1—Construction and Maintenance—Outside Plant.

- Sub-Committee "A"—Construction and Maintenance of Pole Lines.
- Sub-Committee "B"—Wire Crossings.
- Sub-Committee "C"—Underground Construction.
- Sub-Committee "D"—Transpositions.

Committee No. 2—Construction and Maintenance—Inside Plant.

Committee No. 3—Protection Against Electrolysis.

Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits.

Committee No. 5—Telegraph and Telephone Development.

Committee No. 6—Message Traffic.

Committee No. 7—Inductive Interference.

Committee on Nominations.

Committee of Direction—Nominees for Committee on Nominations.

Officers, members of Committee of Direction and Committee on Nominations will be elected at this session.

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The Committee on Nominations will submit for consideration at the meeting the following nominations:

FOR CHAIRMAN

H. Hulatt, manager of telegraphs, Grand Trunk Railway System.

FOR FIRST VICE-CHAIRMAN

W. H. Hall, general superintendent telegraph, Missouri, Kansas & Texas Lines.

FOR SECOND VICE-CHAIRMAN

E. L. King, superintendent of telegraph, Southern Pacific Lines.

FOR MEMBERS OF COMMITTEE OF DIRECTION

G. A. Cellar, general superintendent of Telegraph, Pennsylvania System.

H. C. Chace, superintendent of telegraph, Atchison, Topeka & Santa Fe Railway Co.

E. A. Chenery, superintendent telegraph, Missouri Pacific Railroad Co.

E. E. Dildine, superintendent of telegraph, Northern Pacific Railway Co.

P. F. Frenzer, superintendent of telegraph, Union Pacific Railroad Co.

G. D. Hood, superintendent of telegraph, The Chicago, Rock Island & Pacific Railway Co.

J. A. Jones, superintendent of telegraph, Southern Railway System, Lines East.

J. McMillan, manager of telegraph, Canadian Pacific Railway Co.

C. A. Plumly, superintendent of telegraph, The Baltimore & Ohio Railroad Co.

C. S. Rhoads, superintendent of telegraph, Cleveland, Cincinnati, Chicago & St. Louis Railway Co.

B. J. Schwendt, superintendent of telegraph and signals, Toledo & Ohio Central Railroad Co.

L. S. Wells, superintendent of telegraph and electricity, Long Island Railroad Co.

Of the twelve names submitted for membership on the Committee of Direction six are to be elected by the members present at the convention.

The Committee of Direction, at this meeting, will submit the names of the following ten members as nominees for membership on the Committee on Nominations for the ensuing year—five to be elected:

H. C. Chace, superintendent of telegraph, Atchison, Topeka & Santa Fe Railway Co.

P. F. Frenzer, superintendent of telegraph, Union Pacific Railroad Co.

G. D. Hood, superintendent of telegraph, The Chicago, Rock Island & Pacific Railway Co.

J. A. Jones, superintendent of telegraph, Southern Railway System, Lines East.

J. McMillan, manager of telegraphs, Canadian Pacific Railway Co.

C. A. Plumly, superintendent of telegraph, The Baltimore & Ohio Railroad Co.

J. C. Rankine, superintendent of telegraph, Great Northern Railway Co.

M. O. Scobee, superintendent of telegraph, El Paso & Southwestern System.

F. W. Smith, superintendent of telegraph, Bessemer & Lake Erie Railroad Co.

R. R. Stackpole, superintendent of telegraph, Boston & Maine Railroad Co.

A meeting of the Special Committee on Future Activities will be held immediately following adjournment of the meeting of the Committee of Direction at the Fort Garry Hotel, on Tuesday, September 21, at 10.30 a. m. G. A. Cellar is chairman of the special committee.

ENTERTAINMENT

On Tuesday, September 21, there will be an informal gathering at 8 p. m. at the Fort Garry Hotel—the headquarters of the convention.

On September 22, a luncheon will be served to the visiting ladies in the dining rooms of T. Eaton and Company, and at 8 p. m., there will be a theatre party.

On Thursday, September 23, the visiting ladies will be given a luncheon at the Royal Alexandra Hotel, after which an automobile trip will be given to the Provincial Parliament buildings. At 8 p. m. a banquet will be given to all those present at the convention at the Fort Garry Hotel.

On Friday, September 24, the ladies will be given a luncheon at the Fort Garry Hotel at 1 p. m.

The headquarters of the meeting are to be at the Fort Garry Hotel. Chairman Caskey advises that the hotel management is sending to each member a card asking for information in regard to reservations desired. It is important that these cards be returned by mail as early as possible to insure that every member attending the meeting be properly booked in advance.

B. A. Kaiser, of the Railroad Telegraph and Telephone Appliance Association, who will be in charge of the entertainment program, advises that all arrangements are being made according to plans and that all who attend the gathering will long remember Winnipeg as the right place for a convention.

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SAMUEL W. BEACH, of Washington, D. C., well-known writer on telegraph and radio subjects, and who is a member of the Naval Reserves, has gone to France and Belgium on special duty.

—o—

WILLIAM NOBLE, chief engineer of the British Postoffice Telegraphs, London, has been Knighted by the King and is now Sir William Noble.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethehlem, Pa.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, has returned to his office after a few weeks on vacation.

S. R. CROWDER, office layout engineer, has returned from his summer vacation.

H. J. EIERMANN, of the engineering department, New York, is now in Chicago in connection with the work of installing apparatus in the new main office.

C. C. MAXSON, of the general traffic department, New York, is on his vacation, which he is spending on his orange farm near Tampa, Fla. Mr. Maxson will travel by automobile.

C. R. ZACHARIAS, formerly district commercial manager in the first district, Eastern Division, has been appointed Port Commissioner at Allenhurst, N. J.

J. E. ARMSTRONG, of General Manager Carroll's office, has returned from his vacation.

W. K. FOSTER, formerly in Division Auditor Green's office, has been appointed manager at Plattsburg, N. Y.

L. C. CARMAN, formerly manager at Poughkeepsie, N. Y., has been appointed manager at Amsterdam, N. Y.

AT KNOXVILLE, TENN., the company has leased the building at the corner of Gay Street and Vine Avenue, where a new and thoroughly modern office will be installed. J. J. Downing is manager at Knoxville.

JAMES V. RIDDICK, of the Marine Department, main office, New York, is spending his summer vacation at Tennanah Lake, N. Y.

FRANK D. MURPHY, who has been identified with the operating department, New York, for over forty years, accompanied by his wife, is spending a three months' furlough in California, and is at the present time sojourning at Santa Cruz.

—o—

Brooklyn, N. Y., Western Union

DURING THE NATIONAL DEMOCRATIC CONVENTION at San Francisco, the large telegraph file to and from Huntington, L. I., where ex-Secretary McAdoo lives, was handled in a special office established by John P. Donovan of Superintendent Hayden's office. Mr. Donovan was assisted by John Driscoll.

MISS L. ROBINSON, J. J. Devine and Miss Svea Mannetho, of the superintendent's office, are away on their summer vacations.

MISS M. A. PARR, manager of the 4706 Third Avenue office, is in California visiting with her brother, who is a practicing physician in that city.

THE ASSOCIATION WESTERN UNION EMPLOYEES Local 131, recently elected the following officers to serve for the following year: John P. Donovan, president, re-elected; Miss Anna B. Lyons, vice-president; Miss Lucy O'Grady, secretary-treasurer, re-elected; grievance committee, B. D. Schatzman, Mgr., 295 Ninth St. office; Robert Curry, superintendent's office; John M. McKillen, operator. Delegate to divisional convention, A. D. Shaw, commercial agent. There was a spirited but friendly rivalry among the contestants and the votes for the candidates were very close.

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Western Union, Lake Division

ALBERT MANGOLD has been appointed city foreman of plant at Cincinnati, Ohio, vice A. D. Hale, deceased.

CHARLES R. LAIB has been appointed commercial agent at Cincinnati, Ohio, vice William Hurn, resigned.

M. FINAN was elected to represent Cincinnati employees at the first division assembly of the Association Western Union Employees, held at the Great Northern Hotel, Chicago, August 10, 11 and 12.

F. W. OHLEY, secretary of Local No. 36, Association Western Union Employees, Chicago, had in hand the matter of arranging a banquet in honor of the visiting delegates to the division assembly, who met in Chicago on August 10, 11 and 12. The banquet was at King's restaurant on the evening of August 11. H. F. Kline was the delegate from the general manager's office local to the assembly. Twenty-five delegates were present.

THE LIFE OF A MESSENGER BOY in these stirring days of reconstruction consists mainly of making high scores for a while and then reaping sure-enough rewards. Marvin Rolfs and Edgar Schmidt,

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messengers in the Cincinnati, Ohio, office, during a thirty days' period secured more answers to delivered telegrams than the other boys on the force. In recognition of the boys' industry City Superintendent L. R. Scholl gave them a day off with pay, and with tickets to see a Big League baseball game between the Champion "Reds" and the Philadelphia team. Then along came Bruce R. Allen of General Manager Cronkhite's staff, who gave a banquet at the Gibson Hotel to fifty messenger boys who had been in the service three months or longer.

A. D. HALE, fifty-seven years of age, city foreman of plant at Cincinnati, Ohio, died on July 26. Mr. Hale had been in the company's service since 1887.

Ruth Closson, Telephone Department Organizer, Starts on Long Trip

Miss Ruth Closson, assistant chief operator, in charge of the telephone department at Chicago, has resigned, effective August 15, and after a few weeks' rest with her family, will sail from San Francisco on August 31 for Honolulu.

Miss Closson is a Chicago University alumnus whose very efficient administration of the telephone department has resulted in bringing up to a high standard both the personnel and the service, and her going is a source of keen regret to the local organization.

On her last day at the office, the day and night operators showed their appreciation of her service as well as their personal affection by presenting her with a fine Eastman kodak and decorating her desk with a mass of roses.

While she has not yet fully determined what she will do at Honolulu, Miss Closson may later decide to make that merely a stop on her way around the world. The modern knights errant appear to be more often ladies, and it is still refreshing though no longer unusual to find young women adventuring into far lands for opportunities of service.

Western Union, Gulf Division

J. F. WILSON, district commercial superintendent, has returned from an extended trip to offices along the Mexican border.

F. A. MOHR, general manager, is on a vacation, visiting Great Lakes cities. Returning from Milwaukee he will make calls at Chicago, Omaha and Kansas City.

A WELL-ATTENDED state managers' meeting was held at Tulsa, Okla., on July 31 and August 1. The meeting was in charge of F. H. Austin, district commercial superintendent, City Superintendent Gale of Tulsa, and G. P. Brinkley, division commercial manager. The Association of Western Union Employees arranged a pleasant picnic at Sand Springs for the visiting officials and managers.

L. L. BUTTS, chief clerk in General Manager Mohr's office, is spending his summer vacation at Galveston, Tex.

W. L. MILLER, for many years manager of the stock yards branch office at Fort Worth, Tex., died of heart failure on July 25.

HUBERT WILCOX, night clerk in the Pine Bluffs, Ark., office, while on an outing at Atkins Lake recently, rescued from drowning Burt Scholsberg. Wilcox was in a tree on shore making ready for a dive into the water when he observed Scholsberg in serious difficulties about thirty feet from shore. Wilcox, who is but seventeen years of age, recently won a bicycle race in Pine Bluffs, covering the nine-mile run in twenty-four minutes.

MANAGERS RECENTLY APPOINTED: Jack Delaney, Graham, Tex.; Maude Parr, Marfa, Tex.; L. F. Hornbeck, Sipe Springs, Tex.; J. E. Hall, Toyah, Tex., and A. W. Hoff, Texhoma, Tex.

Oklahoma City, Okla., Western Union

W. P. Moss, valuation engineer, was a recent Oklahoma City visitor.

H. B. MCCHESNEY, supervisor of employment, New York, visited Oklahoma City on July 13. He made many friends during his short stay here.

RECENT OFFICIAL VISITORS in this office included: John Davis, district supervisor of equipment; H. G. Knapp, equipment engineer, and C. T. Bergeron, district clerk, equipment department.

J. S. BUKTON, equipment foreman, has resigned and has returned to his former home in St. Louis, Mo.

CHARLES BLEVINS, wire chief, is on his annual vacation automobiling with his family to various points in the State.

H. S. COVEY, night wire chief, has returned from his summer vacation, which he spent at points in Missouri and Arkansas.

BERT WHITEHEAD, late night wire chief, has exchanged hours with Mr. Covey for two or three weeks in order to familiarize himself with wire activities on other shifts.

Western Union, Pacific Division

M. T. COOK, general manager, accompanied by other Division officials, is on a tour of inspection to the large offices throughout the Pacific States.

G. A. GOFORTH, formerly manager at Olympia, Wash., has been appointed manager at Bellingham, Wash.

F. E. OSBORNE, formerly at Prescott, Ariz., has been transferred to Medford, Ore., as manager.

J. C. COTTER, heretofore manager at North Bend, Ore., has been appointed manager at Ashland, Ore.

P. W. BOYD, operator at Salem, Ore., has been appointed manager at North Bend, Ore.

R. E. MICHAEL has been appointed manager at Olympia, Wash.

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Prize of Twenty Dollars for Most Freckles

The accompanying photographic reproduction is a likeness of Fred Morrisey, the freckle-face King of Seattle, Wash.

Recently, Mayor Caldwell of Seattle crowned Fred as King of Seattle kids because he exhibited more freckles than Wesley Barry, the moving picture star, who was personally appearing at one of the local movie houses; and also, because he was adjudged to have a greater number of freckles than any other boy in the city. Fred was awarded $20 that had been wagered on Barry by the manager of the picture house where Barry was appearing.

Morrisey, the lone passenger in a large automobile, headed a procession through the streets followed by several hundred other freckle-faced youngsters, to the city hall, where the Mayor placed the crown on the boy's head and proclaimed him King of Seattle's freckle-faced kids.

FRED MORRISEY

Western Union messengers were represented by two other entrants in the contest. The slant at which Fred wears his cap harmonizes well with everything else he has to offer, and he is reported to be one of the swiftest, neatest, and most resourceful messengers in the big Sound city.

Telegram of Record Length—A Correction

The item with the above caption which appeared on page 404 of the July 16 issue of TELEGRAPH AND TELEPHONE AGE, referring to a 52,386-word night letter, should have read that the message was "delivered to the addressee at 10 a. m. (Pacific time) June 20," not June 30, as therein stated.

POSTAL TELEGRAPH-CABLE COMPANY

THE EXECUTIVE OFFICES on the tenth floor, 253 Broadway, have been repainted and present a very attractive appearance. At the same time several changes have been made in the assignment of rooms, Mr. Comstock now occupying 1007 and Mr. Dunn 1006 on the Broadway side, and Mr. Daviet occupying 1010 and Mr. Tully 1011 on the Murray Street side.

E. P. TULLY, assistant to the general manager, recently visited Boston, Worcester, and other New England points, on company business.

R. GOULD, of the plant department, spent several days recently in Philadelphia in connection with plant matters.

RETURNING VACATIONISTS on the tenth floor are George Brooks, of the mail department; E. M. Underhill, of the traffic manager's office, and W. J. Pallas, of Mr. Daviet's office. Away this week are Miss Patterson, of the general manager's office, and George O'Connor, of Mr. Tully's office.

NEW MAIN OFFICES have been fitted up at Macon, Ga., and Fort Smith, Ark.

JAMES P. O'DONOHUE, assistant chief engineer, was a recent official visitor at Dallas, Tex., where, accompanied by J. F. Heard, division engineer, of Atlanta, Ga., he made plans for additions and improvements.

J. D. PROSSER, night chief operator at Birmingham, Ala., has returned from his vacation, which he spent in the southern part of Alabama.

T. WALTER COLLINS, assistant traffic chief, Birmingham, Ala., is away on his summer vacation—where fishing is good.

ARRANGEMENTS have been made for the installation of an up-to-date office in the Bedford Building, at Miami, Fla., to accommodate the land line connections with the new submarine cable soon to be placed in operation by the Commercial Cable Company.

EXTENSIVE RECONSTRUCTION of trunk lines is under way throughout the Southern States. In North Carolina a ten-wire lead between Greensboro and Charlotte is being transferred to new poles. The work is in charge of J. B. Murr, foreman.

MANAGERS APPOINTED: S. D. Nolan, Auburn, N. Y.; F. W. Lutz, Granite City, Ill.; Downing McGuire, Hannibal, Mo.; Mildred Ekwall, Galesburg, Ill.; Nettie Nixon, Indiana Harbor, Ind.; A. D. Newton, Ligonier, Ind.; E. G. Hamel, Meridian, Miss., and A. J. Daniel, Montezuma, Ga.

E. V. HARTMAN, manager at Toledo, Ohio, has returned to duty after a severe illness.

AT TOPEKA, KAN., motor generators are being installed to supply current for additional duplex circuits.

M. B. KEAS has been appointed district lineman at Wichita, Kan., vice P. E. Goulder, transferred.

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O. B. DORMAN has been appointed district lineman at Tulsa, Okla.

F. A. LUCK, wire chief at Augusta, Ga., is spending his vacation in the mountains of North Carolina.

New York Operating Department

RECENT VISITORS to the main office include Frank Scott, inspector of telegraph, Canadian Pacific Railway, located at Winnipeg, and George E. Flannery, connected with the same company at Toronto. Mr. Scott was accompanied by Mrs. Scott and daughter, Mr. Flannery by his daughter. The visitors seemed much interested in the department.

THE SYMPATHY of the entire force is extended to relatives of Joseph T. Di Domenico, one of the assistant city chiefs, who died recently.

New York City Notes

JOHN F. MCNEILL, of the 42nd Street office, will spend his vacation commencing August 16th visiting friends throughout Jersey and New York State.

BOB MILLER, of Fulton Market office, is spending his vacation down Cape Cod way.

DR. MARTIN L. JANES, a former messenger and operator, now a practicing surgeon at 24 East 48th Street, and connected with Bellevue Hospital, is a member of the Bronx Committee of the Good-Will Association to promote Americanism and the welfare of all.

THE MAIN OFFICE in Long Island City was moved July 16th from 33 to 52 Jackson Avenue.

MISS ALICE DUNN, supervisor of the telephone department, is spending her vacation in New Jersey.

MISS FRANCES O'DAY, of the telephone department, has returned from her vacation.

MISS MARGARET BARRON, of Mr. Shortall's office, is spending her vacation in Bridgeport, Conn.

Indianapolis, Ind., Postal

In the Indianapolis, Ind., office of the Postal Telegraph-Cable Company, important improvements have been made during the past few months. In the operating, bookkeeping and telephone departments alterations have been made which provide additional space and more modern facilities.

Eight additional line wires have been strung into the Indianapolis office within the past few months. A 250-line telephone switchboard, equipped with long-distance facilities, has been installed. Two telephone circuits are in operation between Indianapolis and Chicago; one between Indianapolis and Cincinnati; one between Indianapolis and Columbus, Ohio, Seymour, Ind., and Louisville, Ky., and a circuit to Terre Haute, Ind. A second circuit is shortly to be opened between Indianapolis and St. Louis.

All of the new telephone and telegraph equipment was installed by O. A. Adney, under the supervision of W. L. Simpson, division engineer, of Chicago, and F. W. Spooner, chief operator of the Indianapolis office.

Under normal conditions the Indianapolis operating department is regarded as an important trunk-line repeater station, and when adverse weather conditions prevail—necessitating the shortening of repeater sections—the repeater division of the office is one of the busiest centers in the country.

The staff is composed of F. W. Spooner, chief operator; H. P. Lewellen, repeater chief; E. F. Dunn, repeater and traffic chief; H. Katzenberger, traffic chief on the day force; J. W. Dobson, night chief operator, and R. R. Ross, all night chief operator.

The telephone department, including long-distance lines, is under the supervision of Miss Ruby Reichert.

John F. Looney is superintendent of the district in which Indianapolis is located. He was formerly division engineer at Chicago, and is thoroughly familiar with operations in all departments of the service—traffic, commercial and engineering.

San Francisco Postal

THE DEMOCRATIC NATIONAL CONVENTION, from a telegraphic standpoint as well as in all other respects, was handled to the satisfaction of everyone. San Francisco is likely to become the Convention City of America. The total number of words of special matter handled by telegraph equaled the amount handled from the Republican convention at Chicago. In handling the Postal's share of the traffic the local officials were assisted by W. W. Morrison, superintendent, Los Angeles; T. N. Powers, manager of the operating room, Chicago; H. E. Patton, superintendent, Seattle, Wash.; John Nearing, commercial manager, Chicago, and S. B. Runyan, night chief operator, Los Angeles.

H. C. SHAW, superintendent, San Francisco, is on his annual vacation.

H. W. PUNCHES, of the engineering department, has returned from Portland, Ore., where he installed new equipment.

DON H. TOWNSEND has been appointed chief operator of San Francisco office, vice M. O'Neill, transferred. The operating room staff also includes C. O. Willette, night chief operator; H. H. Ling, all night chief; F. Arnsberger, wire chief; L. J. Miller, day traffic chief; F. E. Schmediecke, assistant night traffic chief; C. A. Balsley, day quad chief; G. W. Parsons, night quad chief, and N. F. Harrison, all night quad chief.

H. W. BENAS works the Portland local, days; B. McCutcheon, the second Pacific circuit, days, and D. C. Henry and W. J. Rios, the first Pacific circuit, late night trick.

RECENT ADDITIONS to the operating staff, and who are likely to make good progress in the service are: William Quinlisk, S. E. Annis and S. W. Shanks.

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VACATIONISTS recently returned, or who are away at the present time, include: M. J. Wolinsky, J. M. Furr, G. C. Woodward, G. W. Parsons, E. Arding, J. O'Neill, M. O'Neill, T. Coffey and O. Harelson.

IMPORTANT EQUIPMENT IMPROVEMENTS are being made in the San Francisco operating room, including additional operating tables, repeater units and long-distance telephone switchboard. Material is also arriving for a new pneumatic tube system.

MRS. ADA ALLEN, wife of P. Allen, cable operator in the service of the Commercial Cable Company, was struck by a Southern Pacific Railway train on July 27 and seriously injured. She is in Roosevelt Hospital, Berkeley. Mr. Allen was recently transferred to the station at Midway Island.

Telegraph and Telephone Life Insurance Ass'n

Assessment No. 680, dated August 1, has been levied to meet claims arising from the deaths of William W. Kelly, Wilmer L. Malin, Spafford Loveless, Samuel A. Johnson and Michael Harrington.

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The book
of telegraph penmanship
containing prizewinning
specimens submitted in
contests recently participated
in by railroad and
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THE PRICE IS $1.15 PER COPY

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253 Broadway, New York

Death of Mrs. J. B. Taltavall

Sarah I. Taltavall, wife of John B. Taltavall, publisher of TELEGRAPH AND TELEPHONE AGE, died at her home, No. 54 Prospect Street, East Orange, N. J., on August 10. Funeral services were held at the Taltavall residence at 2 p. m., August 12.

Mrs. Taltavall is survived by her husband, three sons and one daughter. Telegraph officials and members of the Old-Timers' Association who attended past gatherings of the Association will remember Mrs. Taltavall as active in the work of arranging entertainment for the visiting ladies. To her husband Mrs. Taltavall has been friend and companion since the day of their marriage, and although her children have grown to maturity her home has been their common gathering place—a home from which each one went out with blessings and renewed inspiration such as only a good mother can give. Her passing away is a severe affliction to Mr. Taltavall, and in his loss he has the sincere sympathy of his telegraph friends in all parts of the country.

Death of William R. Driver

William R. Driver, treasurer of the American Telephone and Telegraph Company, from 1880 until his retirement a few years ago, died at his home in Beverly, Mass., on July 20, aged 82 years. His son, William R. Driver, Jr., is general manager of the New England Telephone and Telegraph Company.

Death of W. L. Dolive

W. L. DOLIVE, aged seventy-seven years, died at Orlando, Florida, on July 3. He was the father of J. C. Dolive, superintendent of the Postal Telegraph-Cable Company at Atlanta, Ga.

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GOVERNMENT LOAN ORGANIZATION,
120 Broadway, New York.

The old wire chief says: "Sometimes it seems that the world is all wrong, and that pretty near every set of conditions and every system under which we labor and live needs radical alterations in order to be just right. Still, as one examines the pro and the con, and the traditional 'two sides' of each question there seems to be a powerful lot of reason for things being just as they are."

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OPPORTUNITY FOR A SUCCESSFUL CAREER IN THE UNITED STATES

Boys Born in Other Countries Recognize at First Sight Advantages Which Boys Born in This Country Too Often Fail to See

Coming to this country from Russia six years ago, a little lad alone and unable to speak a word of English and with barely enough funds to get him to his destination, William Cobb is now employed as night manager in Seattle's largest branch office, and at this time is educating himself through his own efforts. Mr. Cobb, who is still under 20 years of age, now speaks English fluently and without the slightest trace of foreign accent. Mr. Cobb has been asked to submit a sketch of his life since leaving Russia, believing that its publication would hearten the altogether too many American lads who allow themselves to feel that education is unnecessary to get along in the world.

Mr. Cobb's brief story shows what can be done when the right spirit is put into work and educational effort. He writes:

"I was born in Pilviski, Russian Poland, where I lived until I was five years old. Then an accident to my fingers caused me to leave for Konigsburg, Germany, where I went under the care of a professor for six months. During that time the professor took a liking to me and proposed that I stay there until I finished school, and offered to permit me to practice medicine under his guidance. Had I taken up that proposal I would have been a dead German now, but my folks declined his proposal, at the same time letting me attend school for two years. After that I returned home where I studied at the country school and under private tutors 'til I was ten years old, when I prepared to enter the Gymnasium so-called in Russia, which is in our terms, high school.

"I attended the gymnasium for two years while it was under private control but the third year the government assumed control of it and that meant that only a limited number could attend, supposedly those that passed highest. So, when I found out that I passed in my exams all 5's which is the equivalent of "A" in our school system here I considered myself a student of said school. But it seems it was not so easy after all, for my father was sent for and was told that I had passed the examinations but that we would have to satisfy the principal and directors before I could become a member of the school. This privilege was to cost my father 200 rubles (a bribe for the directorate) and sixty rubles per month tuition fee. My father declined to pay any bribe and so that left me out of school as the directors only had a limited number of vacancies and sold them to the highest bidder. I returned home again and resumed my studies under a private tutor, which my father obtained for me.

"I had been planning to try again the following year in another town where a lawyer friend of my father's was a member of the school directorate, but my brothers in Seattle, having heard of this incident, decided that Russia was no place for me and sent me a ticket to come to Seattle where I might enjoy the advantages of this free country. I accepted the invitation and left Bremen, Germany, July 25, 1914, and arrived in New York August 1st; there I stayed a short time and then left for Seattle.

"During my first year in Seattle my brothers supported me while I attended grammar school, but soon two of them left home and I found it necessary to help with the house expenses. So I got a job with a parcel delivery company after school for a few hours. I stayed with them for more than a year, when I quit to help my brother who was then starting in business for himself.

"In the latter part of 1916 my brothers began to voice their sentiments in favor of joining the Allied cause and one of my brothers sold his business in preparation for the same. This was a signal for me to see what I could do to take care of myself while they were at war. I would either have to work all day and attend night school or else leave school altogether. As I was not willing to lose my chance to get an education I started out to look for something that would enable me to attend school and at the same time support myself. This I soon found at the Western Union and I started in as messenger, working nights and attending school in the daytime.

"At first it seemed very hard, but where there is a will there is a way, and so I have been with the company for three and a half years and am still attending high school.

"Working with the Western Union has been a liberal education in itself. When I first arrived in Seattle I could speak no English. In the three years I have been with the Western Union I have improved every opportunity for advancement, working through the various positions until I secured promotion to my present position about six months ago. I have been regular in attendance at school and I have not been absent from duties at the office a single day. As you have asked the question, I will tell you that I owe my advancement in education and position to a diligent and definite effort to get ahead. It has been very hard at times to keep it up and many, many times I have been on the verge of becoming discouraged. I have this to say, too, that employers gladly take an interest in the welfare of their employees, and my experience in the Western Union service is that one has but to show an indication of a desire to do his work well and get ahead and the future is pretty well assured if you continue to do your part.

"Next year I expect to finish high school and attend college as long as I possibly can until I have finished and graduated from one of the country's leading colleges, like Yale or Harvard."

———o———

IN BOLIVIA a telegraph school has been opened in Cochabamba, which started with forty enrolled students.

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Telegraph and Telephone Age

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No. 17 NEW YORK, SEPTEMBER 1, 1920 Thirty-eighth Year

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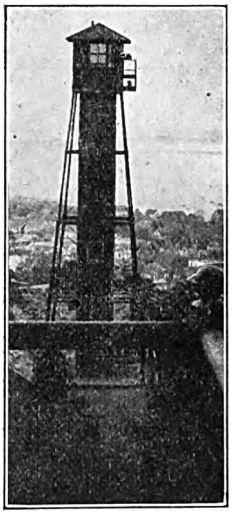
MARINE OBSERVATION TOWERS

In the vincinty of New York Harbor
Connected by Telegraph With News Centers.

Many years before wireless telegraphy was discovered the only method employed to report the passing of ships and the arrival of ships within sight of land was to station observers in towers erected on capes or projections of land along the coasts, generally at points near the larger ports. The advent of radio and its rapid development has, to a certain extent, lessened the importance of the marine tower, as it is now customary for the liners and larger vessels to be equipped with radio apparatus with which they may communicate with land stations from any place on the high seas.

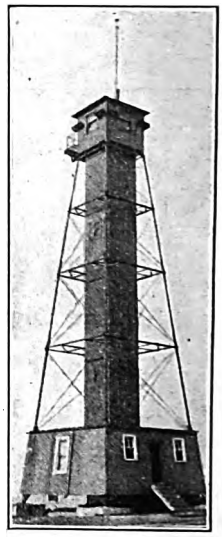
An article appearing in a recent issue of the *Postal Telegraph* says:

"New York has been called the gateway of the New World. Through its portals pass in and out vessels of all kinds, sizes and descriptions destined to and coming from every port in the world—from Archangel to Hobart. At the gateway stand the marine service stations of the Postal Telegraph-Cable Company, sighting and reporting the ships as they draw near. Immediately a vessel is sighted the Observer at the marine station telegraphs the news into the main offices of the Postal Telegraph-



Observation Tower,
Highlands, N. J.

Observation Tower,
Fire Island, N. Y.



Observation Tower,
Sandy Hook, N. Y.

One might be justified in inquiring why the towers still survive. The fact of the matter is there are many hundreds of vessels, especially sailing and cargo ships, which do not carry radio apparatus, so that the movements of these vessels can be reported only from observation towers. Also, towers which are equipped with radio receiving apparatus are able to report the position of any ship equipped with radio sending apparatus, if the apparatus is being used; and, as the towers described in this article are owned by the Postal Telegraph-Cable Company, the observers (all telegraph operators) have at hand telegraph circuits leading directly to a Marine Department in the main operating room at New York. From the Marine Department the information sent in from the observation towers is immediately telegraphed to ship owners, importers, newspaper offices, not only in New York, but in other coast and inland cities.

Cable Company in New York, and from there it is sent broadcast over the land to the merchant awaiting a cargo of goods, or to the individual eager to greet a friend or relative, to the steamship offices, the hotels, the newspapers and others. Large telescopes and powerful field glasses are used to sight the vessels, and on a clear day they may be seen from 10 to 25 miles away. The work of the observers is very exacting, because they must keep their eyes glued to the telescope to get the first glimpse of the incoming vessels, for they realize how much depends upon quick reports. Most of the ships arrive laden with valuable commodities, and the mere announcement of their safe arrival in port means much to those interested in the Exchanges. The lookout men are required to report the cattle ships, the big and little sailing vessels as well as the ocean liners. Some of the "windjammers" are months and months upon the ocean, and the owners, consignees and the relatives and friends

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of those who are in charge of these slow-going crafts wait eagerly for the first news of the completion of the voyages. Only those connected with maritime commerce can know the anxiety that is felt for the safety of delayed and belated sailing vessels, and the men in the lookout towers send many a mesage of good tidings when they announce the approach of some bark or ship whose coming had almost been despaired of.

"The Postal Company has three of such observatory stations at the entrance to New York Harbor, namely, Fire Island, Sandy Hook and the Highlands.

"The Fire Island station is in charge of Mr. Woodward, who is assisted by Mr. McCann and Mr. Doughty. Fire Island is a slender sand-bar off the south shore of Long Island and facing the Atlantic, and is 43 miles long. This island has been the scene of many shipwrecks in the terrific winter storms. The nearest store to our marine station is seven miles away across the Great South Bay to the town of Bay Shore, and in all kinds of weather this bay is crossed by our men to secure provisions for themselves and their families. Mr. Woodward, the manager, has been with the Postal Company for 31 years, 23 of which have been spent on Fire Island.

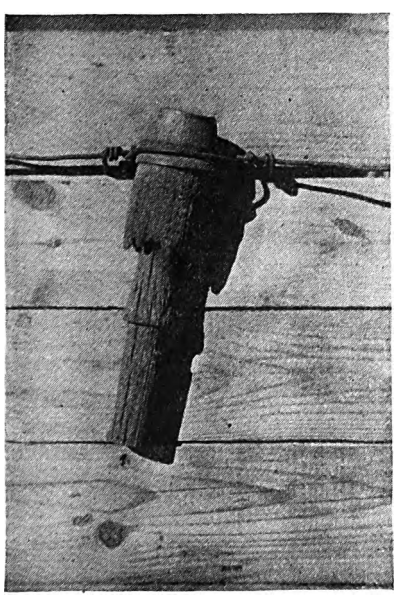
"Our station at Sandy Hook is in charge of William H. Murray, who has been there since its establishment in 1897. He is assisted by Observers Edward D. Bunno and John J. O'Neill. Mr. Murray says that in the winter it is not an uncommon occurrence for the observers on duty to wear their heavy overcoats and fur gloves, because while the tower is generously heated, a low temperature is created owing to the frequent opening of the various port holes and windows for telescopic observation of the ships passing to and fro.

"At the Highlands station we have as manager Mr. S. E. Murray. Mr. Murray has been manager of the Highlands station since it was opened in 1898. Mr. Murray says that during the International Yacht Races off Sandy Hook, the Postal Company's tower is a vantage point for newspaper correspondents from all over the world.

"At all three of the Postal Company's stations it can well be imagined that the conditions in summer are delightful, with the splendid surf bathing right at hand and the cool ocean breezes tempering the summer heat, but in winter—well, that's another story."

A PIONEER WESTERN TELEGRAPH LINE

Eight years before the Central Pacific Railroad was built, when the stage coach and the pony express were the only means of communication across the prairies of the Western States, far-seeing pioneers commenced the introduction of Morse's telegraph to meet the needs of the new country.



In the year 1861 a telegraph line was projected to be built from California eastward. The rush of gold seekers to California and Nevada was at its height, the adventurers traveling by ship around South America, or overland from the Eastern States to the Pacific Coast by stage coach. When about forty miles of the line referred to were built the main objective was abandoned, as other routes had been selected for transcontinental telegraph lines, to be built by other and more powerful interests.

That the builders of this forty-mile stretch of line did their work well is evidenced in the fact that at the present time some of the poles and wire originally installed are still in use, being part of the telephone toll lead between Fallon and Wadsworth,

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Nev. At the latter point connection is made with the modern east and west telephone lines. A portion of this old telegraph line is shown on the right of the roadway in the second illustration. The tree on the left is supposed to be the largest tree in circumference in the State of Nevada. During the early days of the cattle rustlers and horse thieves this tree was used by the vigilante committee to shuffle off not only those "caught with the goods," but suspects.

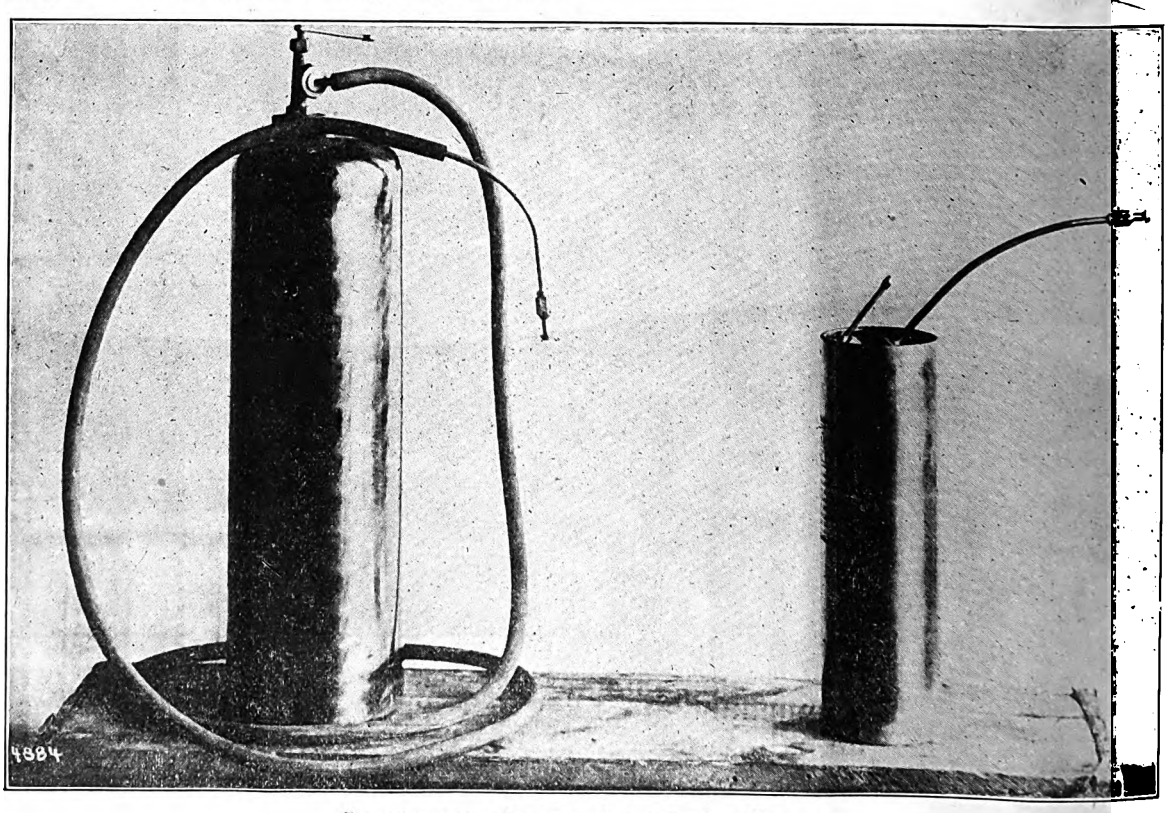
On the 1861 telegraph line the insulator pins were made of oak, and the insulators of lighter wood. At the top of the insulator, where the wire was tied was a zinc cap. The first illustration shows one of these insulators, which was known as the "nigger" insulator. An original sample of these insulators was recently presented to the Old Time Telegraphers' and Historical Association by E. L. Dyer, manager of the Western Union Telegraph Company at Lafayette, Ind.

On the Nevada line these original insulators were replaced by a modern type of glass insulator in the year 1890.

Acetylene Helps Linemen

Telephone and telegraph linemen today find their work easier than it used to be and are able to accomplish more work in a day's tour. This saving in time and labor is due partly to the use of the acetylene torch. Instead of the old style charcoal furnace and soldering iron, which made it necessary to heat the iron at the base of the pole and then climb with it to his work, the present-day lineman may swing a light cylinder of acetylene over his shoulder, kodak-fashion, or use a larger tank which is left on the ground, carrying only the acetylene torch and its flexible hose conenction. All he has to do is to turn the gas cock of the cylinder, open his torch valve and light the tip, and in a trice he has a jet of flame that is not only easy to control and apply, but one that, owing to the intense heat of acetylene in combustion, speeds up his work remarkably.

The small tank of acetylene, such as is designed for strapping to the body, contains sufficient volume of gas for several days, and the larger tank, which carries a gas supply for a much longer period, is also light enough to be carried easily from one point to another along the route of the day's work. The tanks when empty are exchangeable for full ones. There are 22,000 service stations in the United States where cylinder exchanges can be made. The cost of the gas is so low that this expense is practically negligible.



LARGE AND SMALL ACETYLENE TANKS

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INTER-AMERICAN CABLE FACILITIES

The importance of cable facilities in international trade needs no discussion. In the past cable facilities have concentrated where overseas trade has centered. This has made England the greatest cable center of the world.

Greater interest on the part of American manufacturers and exporters and larger participation in foreign commerce have greatly increased the demand for cable communications between the United States and other countries, especially the various Republics of Latin America. The special need in inter-American cable facilities is for direct cable connections with Brazil and the eastern coast of South America. This section has been, and still is largely, served over an indirect route, messages being sent from England via British lines.

The extension of wireless communication and the commercial use of airplanes has an important bearing on the development and extension of cable facilities. A recent report of the United States Shipping Board quotes the opinion of cable company officials to the effect that "not for many years, anyway, will wireless be able to supplant cables." Recent testimony of cable experts even goes so far as to state that wireless communications can not compete seriously with cable messages. The continued investment, however, of large sums of money in wireless plants and the almost daily enlargement of wireless facilities certainly seem to controvert this last opinion.

Cable Facilities

Inter-American cable facilities may be divided into three groups—those which connect the United States with—

(*a*) Mexico, Central America, and the west Indies*;

(*b*) The west coast of South America;

(*c*) The east coast of South America.

For some time past the first two fields have been served with comparative adequacy by American cables; the third field has been reached largely by British lines, the messages going by way of Europe. The principal company serving the first two fields is the "All America Cables." The All America Cables system is operated jointly by the Mexican Telegraph Co. and the Central and South American Telegraph Co., the former having been established in 1879, the latter in 1881.

The system is composed of the following lines of communication: From New York there are two direct duplexed cables to Colon, Panama, touching at Guantanamo Bay, Cuba. These cables continue across the Isthmus of Panama by means of duplicate underground cables from Colon to Panama, extending thence down the west coast of South America as far as Valparaiso, Chile, serving the Republics of Colombia, Venezuela, Ecuador, Peru, Bolivia and Chile.

From Valparaiso triplicate land lines extend to Santiago, Chile, and across the Andes to Buenos Aires, Argentina. Work on the extension of these cables from Buenos Aires to Montevideo, Uruguay, and to Rio de Janeiro and Santos, Brazil, has been in progress for some months past; cables have been landed at all three points, offices opened, and messages have been received since July 1, 1920.

From Galveston, Tex., All America triplicate cables extend to Vera Cruz and Puerto Mexico, in Mexico. These cross the Isthmus of Tehuantepec to Salina Cruz, and extend down the west coast of Central America as far as Panama, where they connect with the company's cables from New York to Colon and Panama. These lines afford communication with Guatemala, Salvador, and Costa Rica. From Vera Cruz there is a duplicate land line to the City of Mexico. Messages between the United States and Mexico are received from and delivered to connecting lines at Galveston.

The Central and South American Telegraph Co. has received a contract from the Colombian Government to connect Colon with the north coast of Colombia; it has also been granted additional landing rights in Costa Rica, at Port Limon. Announcement has been made that a cable connection will be laid from Guantanamo Bay, Cuba, along the east coast of Brazil to connect at Rio de Janeiro with the west coast cables, thus making a complete circuit of the continent.

All America Cables had in operation (July 1, 1919) about 21,400 statute miles of line, of which about 2,000 miles are land wires. The cables recently completed from Buenos Aires to Montevideo and to Santos and Rio de Janeiro add some 2,500 miles to the system. Messages between New York and Buenos Aires are handled without retransmission by hand, i. e., by purely automatic methods, a distance of 7,452 miles, in less than 15 minutes.

Other Facilities in the West Indies

Numerous other lines connect the various islands of the West Indies with the United States, Central America, and South America, as follows:

Cuba.—The island is served by the All America Cables from New York; by the Western Union Telegraph Co. with triplicate cables between Key West and Habana; by the Commercial Cable Co. from New York to Habana; by the United States & Haiti Telegraph & Cable Co. with a single cable from New York to Cape Haitien, where it connects with the lines of the Compagnie Francaise des Cables Telegraphiques; by the Cuba Submarine Telegraph Co.; and by the West India & Panama Telegraph Co.

*The few cable connections between the west Indies and northern South America (Venezuela and the Guianas) may be included in this group.

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Porto Rico.—The island is served by the Western United Telegraph Co. from Habana via the Cuba Submarine Telegraph Co. and the West India & Panama Co.; from New York by the United States & Haiti Telegraph & Cable Co. via Haiti and the French West Indies system; from Halifax by the Halifax & Bermuda Cable Co., the Direct West India Cable Co., and the West India & Panama Telegraph Co. Messages sent by the Central and South American Telegraph Co.'s lines are forwarded by United States Navy wireless.

Haiti and San Domingo.—Haiti is connected with New York by the cable of the United States and Haiti Telegraph & Cable Co. at Cape Haitien. It also receives communications by wireless from the cables of the Central & South American Telegraph Co. via the wireless system of the United States Naval Communications service at Guantanamo Bay, Cuba. This wireless service also reaches San Domingo. The latter country is reached, in addition, by the Western Union Telegraph Co. through connections at Habana with the Cuba Submarine Telegraph Co. and the West India & Panama Telegraph Co., as well as by the wireless service of the Guanica Centrale from Porto Rico. San Domingo may likewise be reached over the lines of the United States & Haiti Telegraph & Cable Co. from New York City.

The Virgin Islands and Guadeloupe.—The Western Union Telegraph Co., through connections at Habana with the Cuba Submarine Telegraph Co. and the West India & Panama Telegraph Co., serves St. Thomas and St. Croix. They also receive messages from the Central and South American Telegraph Co. at Guantanamo Bay, Cuba, via United States wireless; also by the lines of the Halifax & Bermuda Cable Co.; the Direct West India Cable Co., and the West India & Panama Cable Co. Gaudeloupe is connected by the Cuba Submarine Telegraph Co. with the Western Union Telegraph Co. at Habana. From New York messages go via the United States & Haiti Telegraph & Cable Co. and the French West Indies system. From Halifax the Halifax & Bermuda, the Direct West India, and the West India & Panama lines furnish connections.

West Coast of South America—Additional Facilities

In addition to the service of the cables of the Central and South American Telegraph Co., the west coast of South America is served by the West Coast of America Telegraph Co., with offices in Peru, Bolivia, and Chile. European messages are received over the lines of the Western Telegraph Co., with which the West Coast of America Telegraph Co. is incorporated.

The Western Union Telegraph Co. has operated cables between Florida and the West Indies since 1875. These lines are mentioned above. The company has not had facilities for sending messages to South America except via Europe. In 1918 a concession was granted this company by the Brazilian Government to lay a cable from Brazil to one of the islands of the Greater Antilles. A number of landings were possible along the coast of Brazil—Nictheroy (across the bay from Rio de Janeiro), island of Itaparica (near Bahia), Aracaju, Parahyba, Natal, or at Para. From Para the cable was to extend to the Antilles station. South from Nictheroy the cable was to extend to Maldonado, Uruguay, and to Buenos Aires, Argentina.

These concessions, however, have been given up, and the Western Union Telegraph Co. plans to lay an American cable to the island of Barbados, which cable will then utilize the cable of the Western Telegraph Co. from the island of Barbados to Brazil.

The Western Telegraph Co. recently secured permission to lay a cable north from Brazil to the island of Barbados and planned to extend this north by way of Bermuda to Halifax.

List of Cable Companies Affording Cable Facilities in Latin America

The following list gives in alphabetical order the various companies affording cable facilities in Latin America, with special reference to connections between the United States and Latin America:

(1) All America Cables.—This system is operated jointly by the Mexican Telegraph Co. and the Central and South American Telegraph Co. For description in detail of cable lines, see above.

(2) Amazon Telegraph Co. (Ltd.).—This company, whose cables have been in use since 1896, owns submarine cables connecting Para and Manaos on the Amazon River, there being 14 intermediate stations. At Para the cable joins the lines of the Western Telegraph Co.

(3) Central and South American Telegraph Co.—See All America Cables above.

(4) Commercial Cable Co. of Cuba.—Cables run from New York to Cuba.

(5) Compagnie des Cable Sud-Americains.—This company operates seven cables, with a total length of 3,779 nautical miles. The principal cable extends from Dakar, Africa, to Pernambuco, Brazil. At Dakar it is connected with Brest, France, by a French Government cable.

(6) Compagnie Francaise des Cables Telegraphiques.—Cables of the company connect Cuba, Haiti, San Domingo, Guadeloupe, Curacao, Dutch and French Guiana, several points in Venezuela and Salinas on the north coast of Brazil. The company owns and operates trans-Atlantic cables connected with its Caribbean system through the United States & Haiti Telegraph & Cable Co.

(7) Compania Telegrafica-Telefonica del Plata.—This company operates one cable, extending from La Plata, Argentina, to Colonia, Uruguay.

(8) Cuba Submarine Telegraph Co.—Eleven cables, totaling 1,343 nautical miles, are operated by this company. Landings are made at numerous points along the coast of the island of Cuba.

(9) Deutsch-Sudamerikanische Telegraphengesellschaft.—Before the war this company operated

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five cables, with a total length of 7,386 nautical miles. A South American cable from Emden (Germany) via the Canaries and Monrovia, Liberia (Africa), landed at Pernambuco, Brazil.

(10) Direct West India Cable Co.—The cables of this company extend from Jamaica to Turks Island and from Turks Island to Bermuda.

(11) Halifax and Bermuda Cable Co.—The company operates a cable from Halifax to the island of Bermuda.

(12) Mexican Telegraph Co.—See All America Cables above.

(13) Pacific and European Telegraph Co. (Ltd.)—A subsidiary company of the Western Telegraph Co. mentioned below. It operates land lines between Argentina and Chile.

(14) River Plate Telegraph Co.—This company operates cable lines from La Plata, Argentina, to Colonia, Uruguay, and from Colonia, Uruguay, to Montevideo, Uruguay.

(15) United States and Haiti Telegraph and Cable Co.—The cable facilities consist of a single line from New York to Cape Haitien, Haiti. It is operated by the Compagnie Francaise des Cables Telegraphiques.

(16) West Coast of America Telegraph Co. (Ltd.).—A subsidiary company of the Western Telegraph Co. operating cables on the west coast of South America. It connects Callao and Mollendo, Peru, with Arica, Iquique, Antofagasta, Coquimbo, and Concepcion, Chile.

(17) Western Telegraph Co. (Ltd.).—An extensive cable system is operated by this company between Europe and South America, especially Brazil. English cables via Ascension Island and the Cape Verde Islands reach Buenos Aires; also from Lisbon via the Azores and the Cape Verde Islands to Pernambuco, Brazil. Cables extend along the Brazilian coast from Para south, touching at Maranham, Ceara, Bahia, Rio de Janeiro, Santos, Santa Catarina, Rio Grande do Sul, Montevideo, Uruguay, and La Plata, Argentina.

(18) Western Union Telegraph Co.—On December 31, 1918, the Western Union Telegraph Co. owned 22,993 nautical miles of ocean cables; also 3,242 statute miles of land cables. For discussion of the inter-American cable facilities of the Western Union see above.

(19) West India and Panama Telegraph Co.—The cables of this company connect Jamaica, Cuba, Porto Rico, Bermuda, Turks Island, Gaudeloupe, Virgin Islands, Panama, Barbados, Trinidad, and British Guiana.

Ownership of Cable Lines

Regarding the ownership of these cable lines the United States Hydrographic Office reported (see the Communications of the World afforded by Submarine cables, the Principal Land Lines, and the Radio Stations. Chart published by the United States Hydrographic Office. Latest revision August, 1919) as follows:

American:
- Central & South American Telegraph Co.
- Commercial Cable Co. of Cuba.
- Mexican Telegraph Co.
- United States & Haiti Telegraph & Cable Co.
- Western Union Telegraph Co.

British:
- Amazon Telegraph Co. (Ltd.).
- Cuba Submarine Telegraph Co.
- Direct West India Cable Co.
- Halifax & Bermuda Cable Co.
- Pacific & European Telegraph Co. (Ltd.).
- West Coast of America Telegraph Co. (Ltd.).
- West India & Panama Telegraph Co.
- Western Telegraph Co. (Ltd.).

French:
- Compagnie des Cables Sud-Americans.
- Compagnie Francaise des Cables Telegraphiques.

German:
- Deutsch - Sudamerikanische Telegraphengesellschaft.

Argentine:
- Compania Telegrafica-Telefonica del Plata.
- River Plate Telegraph Co. (Ltd.).

Extensions and Improvements

Brazil.—The principal improvements in Brazil are in connection with the extension of the cables of the Central & South American Telegraph Co.'s lines from Montevideo to Santos and Rio de Janeiro, Brazil, and their concession from the Brazilian Government to lay lines direct from that country to the United States; also the extension of the Western Union Telegraph Co. via Barbados.

(*a*) On October 23, 1919, an executive decree of the President of Brazil conceded to the Central & South American Telegraph Co., without monopoly or privilege of any kind and without subvention from the Government of Brazil, the right to lay a submarine cable to connect the cities of Santos and Rio de Janeiro to any part of the territory of Uruguay and to carry out telegraphic communication. A cable from Montevideo was landed at Rio de Janeiro on March 30, 1920. Permission had previously been obtained from the Government of Uruguay to lay cables from Buenos Aires to Montevideo, Uruguay.

(*b*) The President of Brazil also signed a decree granting the Central & South American Telegraph Co. the right to lay and operate a cable from Rio de Janerio to Cuba, to run by way of the Island of Fernando de Noronha (125 miles from the coast of Brazil, northeast from Pernambuco). Work on this extension is evidently to be begun soon. The Central & South American Co. recently announced its intention of laying a cable from Para, Brazil, to St. Thomas Island, from there to Porto Rico, and from Porto Rico to Guantanamo Bay, Cuba.

(*c*) The Compagnie des Cables Sud-Americains was recently granted permission to lay a cable from Rio de Janeiro to Montevideo, Uruguay, and from

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there to Buenos Aires. Permission has also been obtained by this company to take up its cable at Pernambuco, Brazil, and to land the cable at Rio de Janeiro, with a view to covering the entire cable field of the east coast of Brazil.

(*d*) The extension of the Western Union Telegraph Co. for cable service between the United States and Brazil, Uruguay, and Argentina, via the east coast is discussed above.

By decree of September 6, 1918, the President of Brazil declared null and void the concession granted in July, 1908, to Felten and Guillaume-Lahmayerwerke Aktiengesellschaft, of Mulheim on the Rhine, and later transferred to the Deutsch-Sudamerikanische Telegraphengesellschaft, A. G., to establish and operate, without monopoly, an ocean telegraph between a point on the coast of Brazil and the island of Teneriffe.

Chile.—The Central and South American Telegraph Co. purchased and assumed control and operation (Feb. 15, 1920) of the Compania de Telegraphos a Bolivia which had maintained offices in Arica and Tacna, Chile, and in Corocoro, Charana and La Paz, Bolivia. The purchasing company is laying a cable from Arica to Iquique, where the new section of cable will connect up with the company's existing cables and thus give Tacna direct communication with the United States.

The Western Union Telegraph Co. has obtained a concession from the Chilean Government, signed November 7, 1919, to lay a cable between Arica, Chile, and Panama. The company intends to lay from Panama a 1,684-mile cable to connect with the Western Union cable station at Miami, Fla., and from there to Barbados, where connection will be made with cables of the Western Telegraph Co.

Colombia.—According to newspaper reports, late in 1917 the Colombian Government was negotiating for the installation of a cable between the Atlantic coast of the Republic and the West Indies in order to facilitate cable communication abroad and avoid the delay in sending and receiving cables via Buenaventura. The Central & South American Telegraph Co. has recently signed a contract with the Colombian Government, providing for the establishment of a cable service between Colon, Panama, and Cartagena, Colombia. Work on this cable is now being carried on. A cable will also connect Cartagena and Baranquilla, Colombia. The concession permits the company to touch other points on the north coast of the Republic also.

Ecuador.—The Central and South American Co. has announced its intention of laying an additional cable—a third triplicate line—from St. Elena, Ecuador, to Chorrillos, Peru (Callao, Peru). See below, under Peru.

Mexico.—The Mexican Telegraph Co. will lay soon a new cable from Vera Cruz to Campeche, Mexico.

Peru.—The Central & South American Telegraph Co. has decided to lay an additional cable between Callao, Peru, and Santa Elena, Ecuador, connecting at the latter point with the cables now running to Salina Cruz, from which city the cables run to Galveston.

This new west coast line will be used to serve Mexico, Central America, Colombia, Ecuador and Peru, leaving the direct line from New York for Chile and Argentina.

Uruguay.—A Government resolution of September 24, 1918, contained an important provision with reference to cable concessions in Uruguay.

Article 1.—This article refuses to grant the petition of the Western Telegraph Co. for the extension for 30 years of its cable concession, which expired July 15, 1917.

Article 2.—This provides for the presentation to the Chamber of a bill regulating cable concessions.

Article 3.—This article authorizes (con caracter precario) the Central and South American Telegraph Company to extend its telegraph and telephone lines from Buenos Aires to Montevideo.

West Indies.—The extension of the cables of the Central and South American Telegraph Company from the island of St. Thomas to Porto Rico and to Guantanamo Bay, Cuba, is previously mentioned in connection with Brazil, since these West Indies cables are to be connected with the new cable from Para, Brazil, to the island of St. Thomas. An executive decree of the Brazilian government under date of May 18, 1920, grants permission to the Western Telegraph Company to land at Maranham, Brazil, the cable which will be laid from Barbados to the city of Belem, Para.

(The foregoing is from a Latin-American circular prepared by the Latin-American Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.)

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Keep your Liberty Bonds. The subscriber who holds his bonds will not lose a dollar. Market fluctuations do not change the intrinsic value of Uncle Sam's securities or affect his interest payments. Liberty Bonds and Victory Notes—backed by the nation's strength—are the world's premier investment. Buy all you can afford at current advantageous market prices.

GOVERNMENT LOAN ORGANIZATION.
120 Broadway, New York.

Your Money's Worth

One would have a hard job finding anything of use which today sells for the same price it sold for before the war. Everything that goes into manufacture and production of any sort has increased in cost 100 per cent. or more. TELEGRAPH AND TELEPHONE AGE, however, is not only still selling at pre-war figures (two dollars per year), but it is a more useful journal today than ever before. If the reader is not a regular subscriber he should lose no time in sending in his name while the present low subscription rate remains in force.

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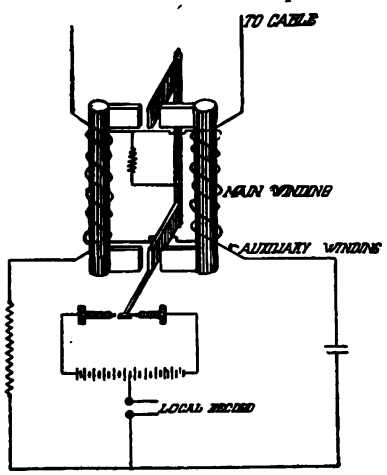
THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

By "Cable Condenser"

(Continued from August 16 issue)

The laying of a cable, as was pointed out, is a most expensive proposition. In the first stages of cable operation cables were worked simplex only. As traffic grew and a greater speed capacity became a necessity the duplex method was brought forward with splendid results. When the traffic increased still further the magnifier was produced so as to get a still greater traffic output.

Magnifiers are supersensitive instruments, one of the most common in use at the present day being

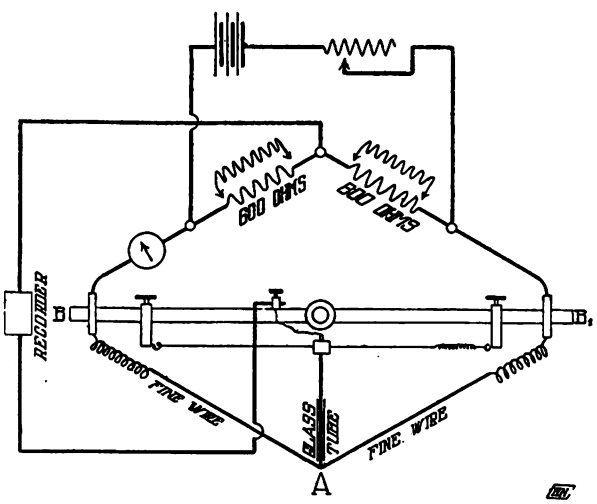


The Gulstad Relay
A Type of Vebrating Relay
Fig. 13

the Heurtley, so named after its inventor. Mr. Heurtley is known among cable people as the "Balance wizard."

To work a cable with a magnifier it is essential that an absolute duplex balance be obtained. Moreover, on many cable circuits where magnifiers were introduced disturbances were observed which did not exist when the circuits were on recorder conditions. The disturbances mentioned were mostly due to induction from other circuits and poor earth contacts. Many cables upon which a magnifier is worked now have "sea" earths—that is, an earth made up of a cable running a mile or more out to sea.

The principle of the Heurtley magnifier is as follows: The control from the moving main line coil of the instrument operates a pointer from which two very fine wires with high electrical temperature co-efficient are attached, the other ends of the wires being attached to points to which are attached two fixed resistances. The two wires form two arms of a Wheatstone bridge circuit, the other two arms of which are the fixed resistances. In place of the ordinary galvanometer, as in the Wheatstone bridge circuit, a recording instrument is substituted, which instrument is an ordinary siphon recorder. This Wheatstone bridge or local circuit is supplied with a current from a local battery which is of sufficient intensity to heat the fine wires considerably above the temperature of the surrounding air. Underneath the two wires, which are called "Hot wires," and close to them, are two slotted tubes which contain air under pressure. These tubes are adjustable and are so positioned that the slots lie parallel to the hot wires, and the slots are adjustable in width so that the volume of air can be varied to suit all requirements. The wires are so positioned that when no signals are being received they lie half in and half out of the blasts of air, so that when the wires are moved by the action of the main line coil one wire is inserted more into the blast of air while the other is inserted less. The effect of this is that one wire is cooled while the temperature of the other is raised, and the two wires forming the adjacent sides of the Wheatstone bridge, these changes are additive, with the result that a current passes through the siphon recorder in the bridge circuit and reproduces the effect of the main line coil but in a much magnified form, depending, of



Heurtley Magnifier Circuits
Fig. 14

course, upon the sensibility to which the instrument is adjusted.

The air tubes are mounted on platforms so that any required position of the tubes relatively to the wire can be obtained. Air is supplied to the "blowers" from a reservoir by two rubber tubes. A

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small electrically driven fan supplies the current of air to the reservoir. The speed of the fan should be sufficient to permit of the taps controlling the admission of air to the reservoir being partly closed and yet allow an ample supply of air to pass into the latter. Too much air will cause the hot wire to shiver, causing disturbances on the recording instrument. The instrument must be installed on a perfectly solid foundation.

The suspension of the magnifier is similar to that of the siphon recorder. The apex of the two hot wires is attached to a two-mil copper wire, which passes through the glass pointer, the latter being made of siphon tubing. The hot wires are platinum and are drawn by the Wollaston method. About three or four mils of platinum wire is coated with silver until the total diameter of the wire is about twenty-five mils. The whole is then drawn down to about three or four mils diameter—this makes the platinum core about .5 mil diameter. The wire is supplied with the silver coating intact and is mounted on the suspension in this condition, the silver coating being finally removed with nitric acid. The wire is generally mounted in one length, the length either side of the pointer being about four and one-half inches. The wire is soldered to the wire leading from the pointer and the other ends are attached to phospor bronze springs which tend to keep the wire at the correct tension.

The silver is removed from the wires by the aid of diluted nitric acid, half water, half acid. The acid is applied to a piece of sheet aluminum about three-quarters of an inch wide, one end of which is bent into a V shape to hold the acid. This is applied to the silver coating on the wire and a heated rod is placed underneath the aluminum to accelerate the action, after which the right working tension is applied to the wires—the resistance of each wire being approximately 220 ohms. The length of the pointer is about two inches.

Some cable engineers are of the opinion that we have not yet reached the highest speed that we can get out of the cable, and when the super-magnifier is produced it will probably bring forth the comment generally made when inventions prove simple: "Why was not this thought of before?"

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

Western Electric Engineer Called by British South Africa

American engineering circles are considerably interested in the announcement that Dr. H. J. Van der Bijl, who figured prominently in the development of the vacuum tube, the nerve center of the radio telegraph, and who is conceded to rank among the leading authorities on thermionics, is about to leave the United States. He has accepted the call of his birthplace and will proceed immediately to his home at Pretoria, British South Africa, where he has been appointed Scientific and Technical Advisor to the Bureau of Mines and Industries of the Union of South Africa. His duties will consist for the main part in establishing a bureau of standards for the authorities of the Dark Continent.

Dr. Van der Bijl comes from an old family of Boers. During the time that Lord Roberts was operating about Pretoria, the father of the well-known scientist was mayor of the doomed city. A few years later Dr. Van der Bijl finished his studies at Victoria College, British South Africa, thereafter entering the University of Leipsic, where he gained his doctorate. He came to the United States in 1912, joining the engineering department of the Western Electric Company, and for the past seven years he has been a prominent member of the research laboratories at West Street. He was instrumental in devising several of the improvements in telephone and telegraph instruments which the Western Electric Company has brought forth during the last few years.

American Paper Now Used Entirely by Telephone Manufacturers

The newspaper trade is not the only industry which is being affected by the shortage of paper. Few users of the telephone realize that one of the big elements in the make-up of the underground cable, and several of the other important adjuncts to the lines of communication, is paper. In fact, it is the big factor for insulating purposes. Several layers of it are used beneath the leaden sheath of cables. The shortage condition of the grade of paper which has always been used has become so acute that several experts of the Western Electric Company are devoting all their efforts to developing a substitute.

Manila pulp paper has always been the favorite among telephone cable manufacturers. Recently wood pulp has been used because of the shortage of the former, but it still lacks several of the finer qualities of the imported grades. Elasticity and a non-porous condition are necessary.

Prior to the war large quantities of all-linen paper made in Europe were used in certain processes in making condensers. None of the American manufacturers cared to handle it, as it required so much attention and had such a limited distribution. However, three companies have now taken over the task in this country, and, although cotton is used to a large extent, their output is as good as that of foreign competitors.

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EDITORIAL COMMENT

Telephone and Radio

Announcement has been made that an agreement has gone into effect between the American Telephone and Telegraph Company and the General Electric Company, for the purpose of advancing the art of radio transmission and communication. The Telephone Company has purchased a minority interest in the Radio Corporation of America, and Mr. W. S. Gifford, vice-president of the former company, has been made a director of the Radio Corporation.

This new development in the Communication world is of large significance. It may come as a surprise to some that the American Telephone and Telegraph Company discerns practical possibilities in radio telephony. The fact of the matter is, as early as the year 1915 the president of the company at that time—the late Theodore N. Vail—issued a formal statement outlining the company's relations with and obligations toward wireless communication, in which it was stated that: "As fast as conditions make it possible, or potential business makes present extensions of prospective value to the system and to the public, either directly or indirectly, the American Telephone and Telegraph Company will extend, enlarge and amplify its system in every way that scientific research and development make possible and social or business demands make desirable. To this end the American Telephone and Telegraph Company will, so soon as the necessary construction and equipment can be assembled, extend the universality of its system by wireless stations at selected points on the coast so located as to enable persons and places not able to be connected in any other way to maintain communication with the world through the Bell system."

The Executives now directing the affairs of the American Telephone and Telegraph Company are to be congratulated upon bringing to fruition at this early date the coordination of effort and of interest which will insure extension and progress of modern methods of long distance communication.

The ably managed Radio Corporation of America gains outstanding advantages in this pooling of resources: much wasteful litigation is, very likely, avoided; duplication of research and engineering effort is minimized, and it would seem that much may be expected in the way of promptly furthering the hook-up of wire and wireless methods of communication, where this is desirable.

—o—

The Convention at Winnipeg

The meeting to be held in Winnipeg, Manitoba, on September 22, 23 and 24, by the Telegraph and Telephone Division of the American Railroad Association, calls attention to the work of a group of men who have contributed materially to the advancement of electric communication in this country and Canada.

In almost every other country in the world telegraph and telephone engineers have societies or organizations composed exclusively of engineers engaged in communication work. In the United States and in Canada there is no technical Association of telegraph engineers. Telegraph and telephone engineers in large number belong to the American Institute of Electrical Engineers, but the subjects these engineers are able to handle through the Institute are limited in number because the presentation and publication of papers on technical subjects cover a wide range—embracing all departments of electrical activity.

For nearly thirty-five years the railroad telegraph superintendents have maintained an organization, the purpose of which, at all times, has been improvement in communication—improvement in methods of line construction; systems of operation, and of standardization.

The character of the technical work done by the various committees of the Association (now the Telegraph and Telephone Division of the American Railroad Association) has, especially during the past few years, been on a plane with the engineering and research work done by other technical organizations of recognized national scope.

The commercial telegraph companies as well as the railroads, in the United States and in the Dominion of Canada, are indebted to the railroad telegraph superintendents who, over a long period of years, have maintained and continuously bettered the usefulness of the only Association we have of telegraph and telephone engineers.

—o—

Letter to the Editor

EDITOR OF TELEGRAPH AND TELEPHONE AGE:

Your editorial regarding the action of the Administration at Washington is very unfair and apparently you are not in possession of the facts underlying the attitude of the administration toward the landing of the Western Union cable at Miami. The present administration has much to be responsible for, and if it were responsible for nothing more than Burleson that would be enough, but Burleson was not behind the stopping of the landing of the Western Union cable as you suggest. The action of our Government in the present instance is entirely right but Burleson is never right.

The fact of the matter is that the Western Union is laying a cable to Barbados from Miami, which will connect at the former place with a British

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owned cable, which will run to Brazil. Now, this latter British cable is owned by a British company which claims certain exclusive rights in Brazil and has prevented the All-America Cables, an American cable company, from landing at certain points in Brazil. Under these circumstances it would seem to me to be perfectly proper for the State Department to insist that the Western Union and the British company relinquish their claim to exclusive rights in Brazil, before they are allowed to land a cable in America which will compete with an American company against which the Western Union and the British company are discriminating. What else have we got a State Department for if it is not to protect the interests of American companies?

And I might call your attention to the fact that the State Department in its present action is merely carrying out the policy announced by President Grant in 1875 in his message to Congress in which he said that this country would tolerate no companies landing cables here which claimed a monopoly at the foreign termini; and our State Department since that time has always insisted that cable companies landing in this country must renounce all claim to exclusive rights. The present State Department is adopting no new course in this regard. If the Western Union sees fit to disregard the 50-year policy of our Government it must take the consequences. Your editorial is, therefore, unfair to the State Department and unfair to American enterprise seeking to compete with foreign enterprise. The action of the State Department is not derogatory to American cable expansion as you would make it appear, but is rather in the interest of such American expansion.

AMERICAN.

Editor's Note

It is true there are several angles to the matter involved which we did not have space for in a short editorial article.

Our chief criticism was that there was little occasion for the sending of five United States war vessels to the Gulf of Mexico. Our idea was that if mail, or telegraphic correspondence, had failed to straighten the matter out, a naval lieutenant might have reached Miami by train, at small expense, and have accomplished all necessary ends.

The information on the subject apparently given by the State Department to the daily newspapers resulted in "scare head" captions which have served poorly any good cause.

We are not alone in our attitude relative to the "Five Destroyers" episode. The Pittsburg (Pa.) Dispatch, a few days ago published an editorial under the caption: "That Cable Sensation" which reads as follows:

"Just as was to be expected, the proposed landing of that British cable at Miami has been called off as soon as the State Department notified the British Embassy a permit would be necessary. This reduces to its proper absurdity all that sensation about "five destroyers patrolling the entrance to the harbor under orders from President Wilson to prevent, by force, if necessary, the landing of the cable, etc."

"The Western Union Company had applied for the permit months ago, having entered into an agreement with the British cable company for the connection. Another American concern has been contemplating the construction of a direct cable from this country to Brazil and there was some question at the State Department whether the landing at Miami would not give the British company a monopoly. All this was a matter for legal and diplomatic action and in no sense, apparently, called for such a tempest in a teapot as the sensational announcements about a cordon of destroyers preventing the landing by force, if necessary. All that seems to have been required at any time was to notify the parties that the Government would not allow the landing until a permit was issued, as has now been done. But that would have prevented a sensational announcement that might make interesting reading in a campaign year."

A Flag Incident

Recently in Seattle, Wash., the Fraternal Order of Eagles had a parade along the main streets of the city. About half-way along the column marchers carried a large American flag. When the Eagles have a parade, as a general thing, the spectacle is worth watching, and on this occasion the streets on both sides were lined with people watching the marchers. The windows of office buildings were filled with workers who vacated desks for a moment to see the show.

In the Alaska Building Mr. Foster Glaspell has offices, and he, too, hearing the band in the street, walked to the window to see what was going on. His first thought may have been that the Molly Maguires were on the rampage, or that ex-Mayor Hanson had something afoot. As Mr. Glaspell reached the window he saw thousands of onlookers in the street viewing the parade, and at that moment the part of the procession carrying the big American flag came opposite his position. He was interested. He was pleased. But he observed that the flag received no more attention than did the drum-major, or the lodge banner. But, wait a minute! What is this? Down at the street intersection a group of seven Western Union messenger boys were delayed temporarily in crossing the street, due to the passing parade. When the flag came opposite where the uniformed boys stood, the lads in prompt unison straightened up and raised their right hands to their caps and remained at attention until the flag had passed.

There was no sergeant present. The boss was blocks away—the boys acted on their own initiative, and of the thousands of persons who watched the parade the little fellows who deliver telegrams were the only ones who rose to the occasion.

Mr. Glaspell was so impressed with this demonstration of Americanism that he wrote a letter on the subject so that the incident might not go unrecorded. It is from this letter we take the facts.

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Student's Course in Technical Telegraphy

No. 11

The space given to the Course in Technical Telegraphy, in the August 16 issue was occupied by a list of twenty examination questions which telegraph students everywhere are invited to answer. Answers should be sent to the editor of TELEGRAPH AND TELEPHONE AGE, in the manner stated in that issue.

there are still in service switchboards of the "peg" or strap-and-disk type. Like other types of switchboard, this board may be made up to accommodate from one wire to 100 or more main wires.

In the large boards there is a row of springjacks situated beneath the vertical line-strips, as shown in Fig. 26. At the extreme left of the illustration

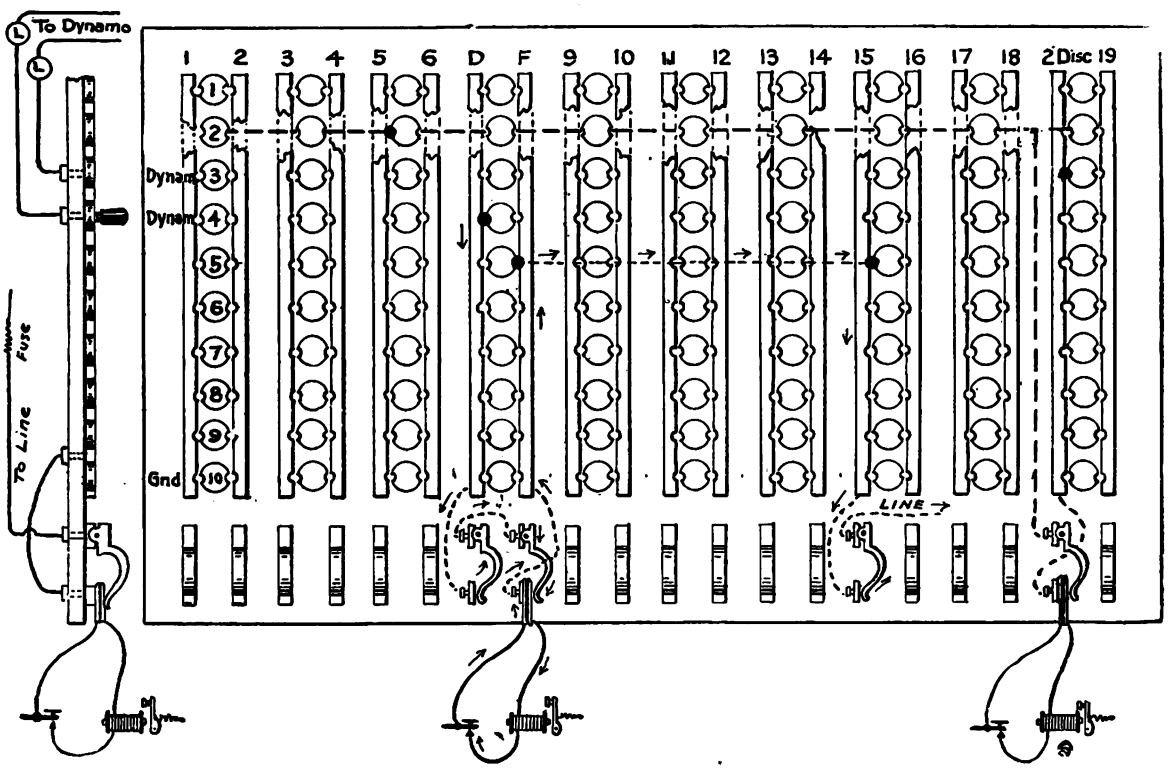

FIG. 26

Lesson No. 10 took up certain pinjack connections of the latest type of Western Union switchboard.

Along many railroad lines, in the service of the Postal Telegraph-Cable Company, and in Canada,

is shown a side view of the vertical strip and the springjack connected to one line wire. The line wire is shown entering the office through a fuse element, from which point it is connected to the shank of the springjack, and—if a set of instruments is con-

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nected to the line by means of a cord and wedge—the circuit continues to the heel of the springjack; thence to the vertical metal strip by means of a short wire connection. The plug shown inserted near the top of the vertical metal strip connects the wire to the source of main line battery, which has one of its terminals grounded, thus forming one end of the line.

The letters D and F, situated between the points 6 and 9 at the top of the board signify "double-flip." A double-flip is made up by connecting in series two springjacks, as shown at the bottom of the board in side view, not connected to any row of disks. The arrangement is used by switchboard attendants to employ otherwise unassigned rows to extend connections to other sections of the board, or for instrument testing purposes.

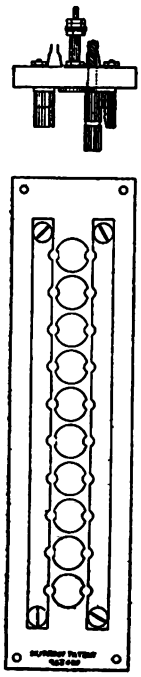

FIG. 27

A main line switchboard made up of strap-and-disk sections, and springjacks, is very flexible. Almost any combination of circuits, instruments, and battery connections may be made with it. It is a type of board, however, that requires considerable experience and knowledge on the part of the attendant. Desired connections have to be traced out in advance from side to side and from top to bottom of the plug holes as they are lined up in rows.

One serious difficulty that has been experienced with the peg type of switchboard is the liability of connection plugs becoming loose and falling out of the board. The purpose of the plug is simply to serve as a metallic bridge between a certain vertical strap and a certain disk in one of the horizontal rows. The plug has no cord attached to it. In cases where a switchboard structure is frequently jarred, or where there is excessive vibration, such as in railroad depots, plugs are liable to work loose and fall away from the board. The plug being small is likely to be overlooked unless its fall from place is heard or seen. When a plug falls from its place a main line wire may be opened, causing an important circuit to remain idle.

In order to overcome this difficulty and still retain the good features of the strap-and-disk board, the Postal Telegraph-Cable Company uses a type of plug connection which by means of spring clips holds the plug in its proper place until it is forcibly removed by direct withdrawal. Fig. 27 shows one unit of this construction. At the top is illustrated in side view a section of the unit with one plug inserted. On the upper surface of this section may be seen two converging springs of strip brass between which the knobbed head of a plug may be inserted. The idea is that while the plug is inserted in a hole in the front of the board in the usual manner, after the head of the plug passes behind the strap and the disks it is firmly engaged by a pair of spring contacts which hold it in place.

These units may be mounted in rows, as many as required in a given installation. Also, when a switchboard consisting of these units is intended for a large intermediate or a terminal office, each unit may have mounted beneath it a springjack of the usual form, or a pinjack, to facilitate connections between line wires and office instruments.

(To be continued)

Telegraphy and Telephony Committee of the American Institute of Electrical Engineers

President Berresford of the American Institute of Electrical Engineers has named for the coming Institute year the following members of the Telegraphy and Telephony Committee: Donald McNicol, chairman, and Messrs O. B. Blackwell, R. E. Chetwood, E. H. Colpitts, A. W. Copley, C. E. Davies, H. W. Drake, H. Hulatt, S. M. Kintner, L. F. Morehouse, J. P. O'Donohue, W. O. Pennell, L. M. Potts, Stanley Rhoads, S. A. Rhodes, A. E. Silver, A. B. Smith, W. K. Vanderpoel and Frank A. Wolff. As chairman of this committee Mr. McNicol continues to serve as a member of the Meetings and Papers Committee of the Institute.

During the past two or three years many additional telegraph and telephone engineers have identified themselves with the Institute as Associates or as Members.

THOMAS A. EDISON traveled from Orange to the Metropolis a year ago to obtain, among other things, a pair of shoes. He was asked $18; the price, and the shoes being pointed, did not suit him and the purchase was not made. A visit was then made to a basement store on Cortlandt Street, where he obtained satisfactory broad-toed shoes for $6, which did service for a year. This is beating the H. C. L. game!

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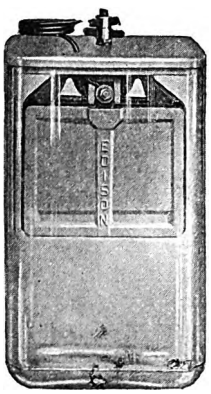
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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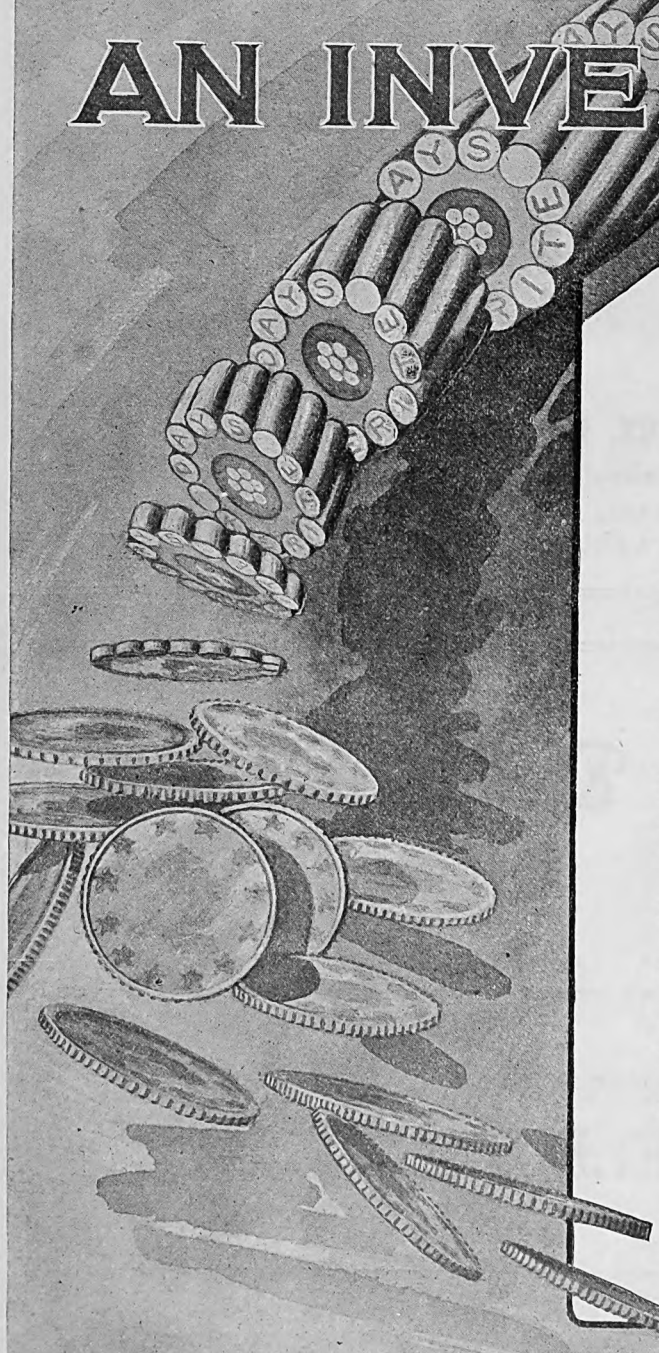

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THE RAILROAD
TELEGRAPH AND TELEPHONE

Railroad Telegraph Superintendents' Meeting at Winnipeg, Man.

As announced in our August 16 issue, the Telegraph and Telephone Division of the American Railroad Association will meet at the Fort Garry Hotel, Winnipeg, Man., on September 22, 23 and 24.

The first session of the convention will be opened by Mr. H. Gray, mayor of Winnipeg; the second session by D. C. Coleman, vice-president of the Canadian Pacific Railway. On the second day of the meeting A. E. Warren, general manager of the Canadian Northern Railroad, will open the first session, and W. P. Hinton, vice-president and general manager of the Grand Trunk Pacific Railroad, will open the afternoon session.

At the banquet which is to be given at the Fort Garry Hotel on the evening of September 23 the principal speaker will be the Hon. Sir James A. M. Aikins, K.B., M.A., K.C., Lieutenant-Governor of the Province of Manitoba. Sir James has been for many years one of the most prominent of Canadian public men, particularly identified with the development of the Canadian North West. For several years he was counsel for the Canadian Pacific Railway, Western Lines.

———o———

THE COMPETITIVE SCHOLARSHIP at McGill University, Montreal, Que., awarded by the Canadian Pacific Railway Company, has been won by S. D. Rudenko, clerk in the commercial telegraph department of the C. P. R. Telegraphs at Montreal. The scholarship covers a four years' regular tuition, and is awarded once each year by competitive examination to an employee enrolled on the permanent staff of the company, and who is under twenty-one years of age.

JOHN MCMILLAN, manager, Canadian Pacific Railway Company's Telegraphs, has started on a trip to points in Alaska. He is accompanied by Mrs. McMillan and their two daughters.

A. B. SMITH, late manager of telegraphs, Grand Trunk Railway, Montreal, Que., accompanied by Mrs. Smith, is spending the summer at Old Orchard, Me. Mr. Smith is in fairly good health and still takes a keen interest in railroad and telegraph affairs.

———o———

Beaver Interrupts Telegraph Service—In His Own Way Destroys Enemy's Lines of Communication

On August 19, the telegraph and telephone wires on the main line of the Canadian Pacific Railway, about sixty miles west of North Bay, Ont., were interrupted and service for a time came to a standstill. Linemen, upon reaching the scene of the trouble made the discovery that an industrious beaver had cut down a large tree near the pole line. When the job was completed and the tree fell it crashed into the wires carrying them earthward, all in a jumble.

In the northern districts of Ontario, through which the transcontinental railroads pass, there have been several instances of moose getting their antlers entangled in wire leads, where, for maintenance purposes, the wires are carried on short poles. On one occasion of this kind the moose was found dead, having become exhausted in his fight for liberation, or having been killed by lightning.

Recently, in British Columbia, an itinerant bear was mislead by the humming of the wires, thinking he had discovered a bees' nest and no end of honey. Bruin climbed a telegraph pole, aiming to get to where the music was, and in his search for sweets up around the cross-arms managed to cross two wires so effectively that a lineman had to journey to the spot and straighten them out. In the meantime, presumably, Bruin had wandered away to join the skeptics.

BASED ON THE REPORT of Committee No. 6, Telegraph and Telephone Division, American Railroad Association, the Grand Trunk and Grand Trunk Pacific Railroads have adopted a standard form for railroad telegrams. The blank has spaces in which the sender of the message indicates by a check mark whether it is to be sent as a "preferred," "day," or "night" message. There are spaces also for recording the time dictated, time typed and time filed in the telegraph office.

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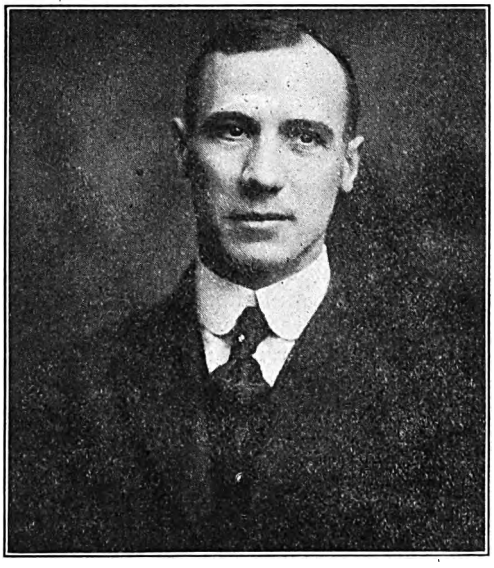
P. G. GALBRAITH

Telegraph Inspector, C. P. R. Telegraphs, London, Ont.

Mr. Galbraith is a Canadian telegrapher who has made good headway in the service without departing far from his home town. He was born at Toronto, Ont., on August 2, 1879, and when thirteen years of age entered the service of the Canadian Pacific Telegraphs as messenger boy in that city.



P. G. GALBRAITH

From the start he had the good fortune to be intensely interested in the telegraph business. From the start he made good in each position in which he was placed; his experience being that no sooner had he mastered the details of one position when he was advanced to a more important place. For twenty-one years continuously he was employed in the Toronto district; filling successively the positions of branch office operator, collector, delivery clerk, cable clerk, stenographer, and chief clerk to the district superintendent.

In the year 1913 Mr. Galbraith was appointed telegraph inspector with headquarters at London, Ont., which position he still occupies.

THE ASSOCIATION OF RAILWAY EXECUTIVES, the advisory committee of which Daniel Willard is chairman, has set for its goal in the improvement of railroad transportation service, the following definite ends: 1. An average daily minimum movement of freight cars of not less than 30 miles per day; 2. An average loading of 30 tons per car; 3. Reduction of bad-order cars to a maximum of 4% of total owned; 4. An early and substantial reduction in the number of locomotives now unfit for service; 5. More effective efforts to bring about the return of cars to the owner roads.

SUBMARINE CABLE ITEMS

JOHN B. HEMMING, superintendent of the Commercial Cuba Cable Company, at Havana, Cuba, is away on an extended vacation, spending the time in Nova Scotia, where he was stationed at Canso for many years.

JOHN W. LAWSON, superintendent, Commercial Cable Company, Rockport, Mass., has been appointed acting superintendent at Havana, Cuba.

HARRY C. WILSON, who was superintendent of government telegraph lines at Kingston, Jamaica, for forty years, previous to his retirement six years ago, came to New York in April to undergo a delicate operation. He has now entirely recovered and will return to Jamaica, accompanied by Mrs. Wilson, sailing from New York on September 7. Mr. Wilson comes from a family of telegraphers. His brother Frank was superintendent of the Commercial Cable Company at Boston since the organization of that company until his retirement a few years ago. Another brother, Arthur A. Wilson, is manager of the Gold Street office of the Commercial Cable Company, New York. Mr. Wilson is well known in New York City, and is now visiting numerous friends before returning to Jamaica.

Western Union Cable System

C. H. Macbeth, late Scottish district manager, at Glasgow, has been appointed northern divisional manager, with temporary offices at Western Union House, London. A. Croysdill has been appointed local manager at London. Mr. Croysdill entered the Atlantic cable service twenty-five years ago and for some years past has acted as assistant to C. V. Auger, district manager at London. C. V. Auger, heretofore district manager at London, has been appointed southern divisional manager, with headquarters at Western Union House, 22 Great Winchester Street, London.

New Cables to Cuba

The All America Cables, Inc., announced on Aug. 23, that four permits have been received from the Government of Cuba to land cables on the Cuban coast, which will result in greatly improved service between that country and the United States, as well as between the United States and Central and South American points.

One of the cables is to be landed at Havana, the other terminal to be New York or some other American city to be selected. Another will land also at Havana, with the other terminal in Mexico or Central America; a third will be laid from Havana along the north coast of Cuba to the Bay of Guantanamo, and the fourth is to be from the Bay of Guantanamo to Santiago.

IN HONDURAS the ministry of promotion has authorized Samuel Zemurray to erect a radio telegraph station at Puerto Cortes.

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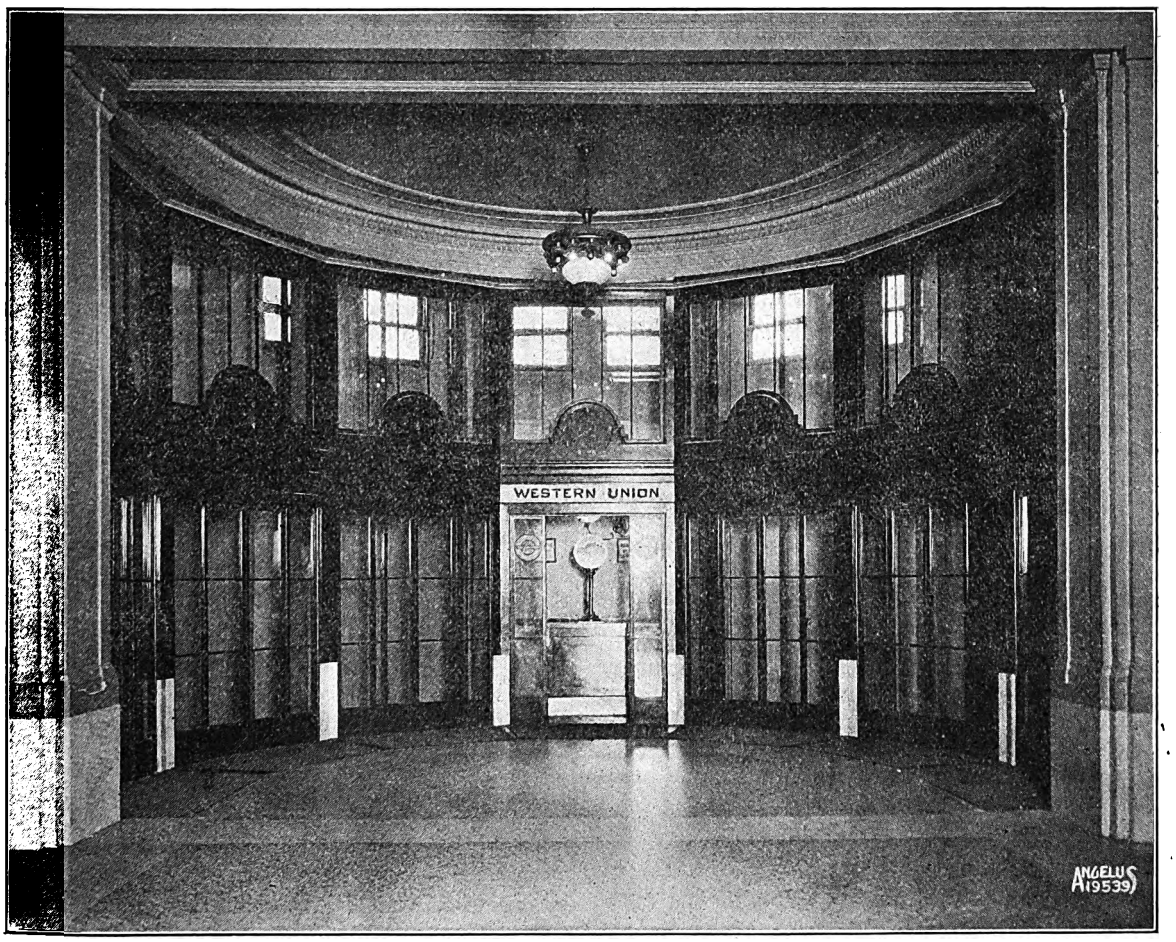
An Attractive Telegraph Office

Certainly the most novel and unique telegraph office in the Northwest, and probably without parallel elsewhere, is located on the ground floor lobby in the center shaft of a battery of seven elevators of the Pittock Block, which occupies a full city block in Portland, Oregon.

It is situated right in the center of all building traffic and in full view from the wide lobby entrances from three streets. It is so striking that walls and ceiling are built in, and in keeping with the high class interior finishing; the furniture is mahogany and marble, arranged in accordance with Western Union standards.

A white vitrolite sign, with the standard blue letters "Western Union" sand blasted in, extends across the office entrance and this, with the canteen sign on the counter and the trade marks on the windows, beautifully advertises the office.



TELEGRAPH OFFICE IN PORTLAND, OREGON

edestrians passing on the street cannot fail to see , and many enter the building to inspect and adire it. The Portland newspapers, before the office ad been completed, and in advance of publicity repared by City Superintendent Williams, found it nd sent their photographers to take pictures, which ney published with a write-up as an item of news alue.

The space is six feet wide at the entrance, nine eet in the rear and seven feet deep. The floor,

The location is ideal for serving the tenants of the building, which is its exclusive purpose. The elevators are immediately at hand, and the neatly uniformed girl messengers lose no time in reaching any floor of the building. The tenants are very much pleased with it, and in addition to commending Mr. Williams for having established this most novel and unique branch in the Pittock Block, assured him of their hearty co-operation in making it a profitable investment.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH CO.

CAPTAIN THEODORE ROYEN of the Western Union cableship *Robert C. Clowry* was taken ill on board ship on August 24, and was removed to the city Hospital at Jersey City, where it was learned that he had Bright's disease. Captain Royen failed rapidly and passed away on August 26. Funeral services were held at his late residence on August 28.

J. S. CALVERT, superintendent at Philadelphia, Pa., was a recent Executive Office visitor.

S. B. HAIG, division traffic superintendent, New York, is spending his vacation at Coburg, Ontario.

MISS M. E. HOUK, of General Manager Carroll's office, has returned from her vacation.

R. O. WALTERS, manager of the Wood Street office in Pittsburgh, Pa., was a recent Executive Office visitor.

THE WESTERN UNION TELEGRAPH COMPANY has been granted permission by President Menocal of Cuba to land a submarine cable at Playa de Cojimar, near Havana. Lines will extend to Barbados Islands and to Miami, Fla.

EDWARD A. FRASER has been appointed manager of the office at Portland, Maine, succeeding Harry H. White, resigned. Mr. Fraser started in the service as messenger boy at Portland eighteen years ago, since which time he has occupied various positions in the company's service from clerk to district commercial manager.

F. T. HELF has been appointed chief operator of the office at Beaumont, Texas.

G. W. CAREY, assistant manager of the office in Havana, Cuba, is in New York, where he will remain during the month of September. While in New York Mr. Carey will place his two sons in school.

R. L. RAYMOND, of the Tampa, Fla., office, has been transferred to Havana, Cuba, where he will be an assistant chief operator.

E. S. REEVES, of the Havana, Cuba, office, now on vacation at Atlanta, Ga., will spend several weeks in the automatic department, New York, before returning to Havana.

DELEGATES from Pacific coast locals, Association Western Union Employees, to the National Convention, include: A. F. Schmidt and J. W. Molt, Portland, Ore.; M. L. Patty, Seattle; W. F. Straub, Spokane, Wash.; D. J. Carr, Thomas Gutterson and John F. Dodge, of San Francisco, and George C. Terry, Los Angeles.

New York Western Union

J. V. RIDDICK, of the Marine Department of this company, will take charge of the Maritime Exchange Office at 78 Broad Street, on September 1. Mr. Riddick, during his many years' service in the main operating department, has gained the friendship of all employees with whom he came in contact, and he goes to his new position with the good wishes of many friends.

AMONG THE VISITORS at 24 Walker Street during the past month was S. H. Strudwick, of North Sydney, N. S. Mr. Strudwick was identified with the New York main office as a Wheatstone expert in the early eighties, past, and in later years was a member of the cable office staff at North Sydney.

EDWIN W. MESLER, aged 51 years, a member of the operating staff, died of apoplexy at his home in East Orange, N. J., on August 18. Mr. Mesler is survived by his wife and nine children.

THE SYMPATHY of his friends are extended to William Regan of the operating force, whose father died recently.

J. P. BANKS of the marine department and S. C. Crumpton, assistant chief operator of the distributing center, are absent on vacation.

GEORGE E. MURPHY of the marine department is in attendance at the Old Timers' Reunion at Toronto this week.

Needles, Cal., Western Union

The new repeater station established at this point has as chief operator I. E. Whitaker; night chief operator, I. J. Whitney, and late night chief operator, E. H. Heintze. Mr. Whitaker heretofore has been a member of the testing and regulating department at San Francisco; Mr. Whitney has been manager at Kingman, Ariz., and Mr. Heintze is from the plant department at New Orleans, La.

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POSTAL TELEGRAPH-CABLE COMPANY

GEO. G. WARD, vice-president and general manager, Commercial Cable Company, returned from Europe on the *Aquitania* on August 21.

E. C. PLATT, treasurer, Postal Telegraph-and Commercial Cable Companies, also returned from Europe on the same date.

M. M. DAVIS, for many years electrical engineer of the Postal Telegraph-Cable Company, and who, some months ago, was granted leave of absence on account of ill health, has tendered his resignation to the company. Mr. Davis has been living at North Chatham, Mass., since giving up active service and while the change and relaxation has resulted in considerable improvement, Mr. Davis does not feel prepared to return to active duty.

E. P. TULLY, assistant to the general manager, is visiting offices in Superintendent Leonard's district.

W. B. DUNN, secretary, is spending his vacation at Sacandaga, N. Y.

J. F. SKIRROW, chief engineer, is a daily commuter to North Asbury Park, N. J., where he is occupying his summer bungalow at Wamamassa on the shore of Deal Lake.

I. SMITH, superintendent of tariffs, left on his annual vacation August 28.

A. H. CLARK, for many years chief clerk to C. F. Leonard, district superintendent, will be transferred to the staff of the chief engineer effective September 1. He will be succeeded in the superintendent's office by John Henry, formerly with the bookkeeping department.

F. J. KERNAN, auditor, as has been his custom for several years, is spending the summer at his bungalow on the outskirts of Morristown, N. J.

JOHN H. MAYER, assistant to the division engineer, Eastern Division, has returned from his vacation, which he spent in New Jersey with his family.

W. S. HALLETT, superintendent of supplies, is away on his annual vacation.

JOHN F. CLEVERDON, chief inspector, engineering department, is away on his annual vacation, which he is spending at points in New York State.

MANAGERS APPOINTED: J. J. McNavin, San Bernardino, Cal.; J. C. McCollum, Atlantic City, N. J.; E. H. Brooks, Garden City, Kan.; Rosa E. Tucker, Thomasville, Ala.; J. M. Ward, Pocatello, Idaho, and Dorothy Douglass, at Kissimmee, Fla.

Reports showing energy and resourcefulness on the part of station linemen in going after, and clearing trouble, are constantly coming to the attention of both the traffic and plant departments. Two recent cases are from opposite sides of the continent. On a recent Sunday a loss of all wires was reported west of Binghamton, N. Y. On account of the day, and the time, it was difficult to get in touch with the stationmen in the immediate vicinity of the trouble, but lineman O'Rourke of Elmira, accompanied by Manager McIntyre, promptly stated east, and after a drive of 45 miles, had everything clear and wires working at 5 p. m. The other case is in connection with clearing trouble at night on our line between Portland and Seattle, where lineman Clear, of Tenino, and lineman Lord, of Kelso, covering by the aid of lanterns, a section of line built on the side of a mountain, succeeded in locating a bad break at midnight, and having all circuits ready for business the next morning. This is typical of the spirit of our station-men.

New York City Postal

L. P. COLE, manager of Washington Market Office, who has been ill for several months, is rapidly improving and it is hoped he will soon be in his old-time health. L. P. C. is one of the oldest of our city managers in point of service, and everyone will be glad to see him resume active duties.

THE FAMOUS THOROUGHFARE BUILDING, at 58th Street and Broadway, will soon be demolished to make room for a modern office building. This makes it necessary to secure a new location for our branch office in that district; a difficult task because of the great demand for space in that vicinity by automobile concerns.

D. SHORTALL, manager messenger department, is spending his vacation in New Hampshire.

D. SULLIVAN, manager New York office, is spending his vacation in Sullivan County, N. Y.

New York Operating Department

T. H. TIERNEY, overland quad chief, has returned from a vacation spent pleasantly at Nantucket, Mass.

W. B. CAMPBELL, one of the western quad chiefs, is another returned vacationist, his leisure time having been put in in the Berkshires.

Washington, D. C., Postal

J. G. TRUNNELL, chief operator, has returned from his annual vacation.

H. D. GERMER, all night wire chief, during his vacation visited with relatives in northern Pennsylvania.

H. R. EBERSOLE, supervisor of southern way circuits, whose home is in Wincheser, Va., is away on his annual vacation.

E. F. MCCARTHY, of the Washington-Chicago bonus circuit, spent his vacation at Atlantic City, N. J., and at Colonial Beach.

J. E. TIMBERLAKE, of the Washington-New York

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bonus circuit, recently spent a week with his family at Ocean View, Va.

BARNEY BECKER, of this office, during his vacation rested up at Atlantic City.

A. J. GROSS, of the Washington-Augusta bonus circuit, spent his vacation at Asheville, N. C.

CHARLES S. TEBBS, cashier, and Miss PAULINE E. CALLAHAN, receiving clerk, were married in Baltimore on July 21. They took a honeymoon trip on the *Southland,* down the Potomac to Ocean View, Va. The Washington office staff presented the couple with a handsome set of silverware.

Boston, Mass., Postal

BROOKLINE, MASS., branch office has been renovated and now presents an up-to-date appearance.

MISS M. CLAIR has been appointed manager at the Tremont Street branch, vice C. T. Day transferred to the Beacon Street branch as manager.

CHIEF BOOKKEEPER D. F. FINNALLY and J. GOLDSTEIN, in charge of the messenger department, enjoyed their vacations on the North Shore, returning to work as regular "Brownies."

EDDIE NAZZARRO, collector, spent two weeks at Bellows Falls, Vermont, while on vacation.

Chicago, Ill., Postal

E. W. COLLINS, general superintendent, is on an extended business trip to offices in Colorado, Kansas, Wyoming and Missouri.

L. R. THOMAS, superintendent, sixth district, has returned from a business trip to points in Minnesota.

MISS NELLIE VEALE, stenographer to the general superintendent, has returned from a vacation spent in Milwaukee, Wis.

MRS. ALICE FUND, clerk to Cable Supervisor Bennett, is spending her vacation with a sister in New York.

FRANK SARYNSKI, in charge of the general office mail, has returned from a vacation spent at Lake Marie, Ill.

RECENT CHICAGO VISITORS INCLUDED: W. F. Coleman, manager at Davenport, Ia., and V. E. Blume, manager at St. Louis, Mo.

A. J. DAVIES, chief clerk to Superintendent J. G. Blake, is receiving congratulations upon the arrival of a son in his family.

ANNA PETERSON, of Superintendent Thomas' office has returned from a vacation spent at points in Michigan.

E. A. NEWMAN, manager at Des Moines, Ia., accompanied by his family, spent his vacation at his home in Rockford, Ill.

MANAGER CHARBONNEAU, of Fon du Lac, Wis., accompanied by his wife, spent his summer vacation at Montreal, Que.

MANAGER LANG, of Escanaba, Mich., has returned from a vacation which he spent at points in Michigan.

C. M. BAKER, general superintendent of plant, during July and August covered the new line being constructed between Tulsa, Okla., and Oklahoma City. The new line traverses the oil belt of Oklahoma and carries four No. 9 copper wires, transposed for telegraph and telephone service. Mr. Baker has also made inspections of work under way or planned in territory both east and west of Chicago.

Seattle, Wash., Postal

E. J. BATEMAN, Butte, Mont., was called to Portland, Ore., recently on account of the illness and death of his sister.

H. E. PATTON, superintendent, is receiving from managers and other employees in his district complimentary references to his success in managing the affairs of the district during his first year of office.

ROBERT H. COREY has been appointed operator at Astoria, Ore.

M. J. LORD, lineman at Kelso, Wash., and lineman F. L. Clear, at Tenino, Wash., recently established a record for quick work in clearing a bad line wreck near Castle Rock, Wash.

ELDON SHEPPARD, messenger at Salem, Ore., carried off three first prizes in bicycle races recently held in that city.

NORMA CADE, superintendent's clerk, has returned to duty after a trip to Vancouver, B. C.

G. E. PILCHER, chief clerk to the superintendent, was a Spokane, Wash., visitor recently.

AUTOMOBILES have been supplied to linemen at North Bend, Ore., Easton, Wash., and Wallace, Idaho.

J. H. Wooten Talks to Rotarians

J. H. Wooten, manager of the Mackay Telegraph Company at Galveston, Texas, entertained the members of the Rotary Club of Galveston on August 19 with a very interesting discussion of the development of the telegraph throughout the country. The talk was given following the club's regular weekly luncheon.

Beginning with the history of the early development of telegraphy, Mr. Wooten developed the story in an interesting and entertaining manner, cleverly mingling the interesting story of facts with an occasional amusing incident that at one time or another has developed in the business.

Figures given on the present extent of the telegraph service in this country were particurly interesting.

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RADIO TELEGRAPHY

Radio Corporation of America Notes

E. J. NALLY, president, sailed from England for home on the *Imperator* August 28.

G. J. ESHLEMAN, engineer in charge at the New Brunswick, N. J., station, has been transferred to Hawaii as representative of the plant engineer's office. He is succeeded at New Brunswick by Thomas J. Hayden, formerly engineer in charge at Tuckerton, N. J., station, and he in turn is succeeded by Howard J. Smith of the Tuckerton station.

F. M. HAMMOND has been appointed assistant engineer of plant department and assigned to duty as field representative in connection with construction of New York Radio Central station, Rocky Point, Long Island.

J. S. PHILBRICK, engineer in charge, Kahuku station, has exchanged assignments with W. H. Graff, formerly engineer in charge at Bolinas.

—o—

THE INTERNATIONAL RADIO TELEGRAPH COMPANY has adopted the plan of calling traffic schedules at all International Company stations every two hours during the day and night—on the even hour. This improved schedule will permit ship operators to know exactly when to be on the lookout for possible calls from any of the company's stations.

—o—

Independent Wireless Telegraph Company

D. V. APPLEGATE is contract manager for this company, with offices at No. 42 Broadway, New York.

THE COMPANY'S New York station is being equipped with an arc transmitter in order to increase the range of working with transatlantic vessels equipped with the company's apparatus. The spark transmitter in service is operated at 1700 meter wavelength in order to avoid interference from stations operating at shorter wavelengths.

THE INDEPENDENT WIRELESS TELEGRAPH COMPANY now has radio installations on nine hundred seagoing ships. On the vessels equipped with the company's apparatus a magazine is published for sale to passengers, the name of which is *The Independent Wireless News.*

—o—

Institute of Radio Engineers

At the September 1 regular meeting of the Institute of Radio Engineers, held in the Engineering Societies Building, New York, an important paper was presented by Dr. Eugene Nesper, on the subject of "Recent Progress in Radio Communication in Germany and Austria."

—o—

International Communications Conference

The Japanese delegates to the International Communications Conference to be held in Washington, D. C., beginning September 15, have arrived in New York. The delegates are S. Kagayama, representing the Department of Communications; I Inouye, representing the War Department, and J. Kiyokawa, representing the Navy Department. The Japanese Ambassador at Washington is to be the head of the Commission, and each of the delegates has as an aid an attache familiar with the subject of electric communication. Suteji Suzuki, telegraph engineer in the Department of Communications, Tokyo, is one of the attaches. After the Conference has concluded its deliberations Mr. Suzuki will remain in the United States until the end of the year making an investigation of American telegraph systems and methods.

—o—

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

—o—

W. H. Hawkins has been appointed president of the United Press, succeeding Roy W. Howard, who has been identified with the United Press organization since its formation in 1907. Mr. Howard has been elected a director of the Scripps-McRae League of Newspapers. The appointments are effective from August 1.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York

THE MAN who halted on third base to congratulate himself failed to make a home run.—*North West Postal News.*

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Box Scores Handled by Telegraph Printer

Superintendent D. L. Howard, of the Canadian Pacific Railway Company's Telegraphs, Calgary, Alberta, has forwarded to headquarters at Montreal, Que., a copy of a baseball box-score transmitted by and received on a Morkrum printer circuit. The form shows the names of the players on the opposing teams, the position played, and the runs, hits, errors, etc., made by each man. The copy as received is as clear and free from errors as if copied by a first class Morse operator long experienced in copying score forms.

P. G. Bowman, chief operator of the Calgary office, makes inquiry asking if any other office has succeeded in handling baseball scores over printer circuits.

Telephone Cable for the Swedish Government

One of the most important steps in advancement in Europe since the great war has recently been taken by the Swedish government, which has ordered from the International Western Electric Company a long distance telephone cable to be placed between Stockholm and Goteborg, a distance of more than 10 miles. This cable is the latest type used by the American Telephone and Telegraph Company and employs relatively small gauge wires, but provides first-class service, due to its equipment with Pupin loading coils and telephone repeaters. By this means a great number of circuits is provided in a relatively small cable at a cost considerably less than an equivalent number of open-wire circuits.

This cable is the first of a large network contemplated by the Swedish government. Should the other governments of Europe decide on similar installations, it is only a question of time when universal telephone service throughout Europe may be expected.

Triple Rates for Urgent Telegrams

The exchange of urgent telegrams at triple rates between points in Great Britain and points in France became effective on July 1, on the same conditions as exist in other countries where this system is in force.

THE WIRES of the Postal Telegraph-Cable Company of Louisiana (pole line 73 miles, wire mileage 123 miles) have been sold to the Cumberland Telephone and Telegraph Company of Kentucky. The consideration is said to have been $21,816. W. L. Jones, president of the Postal Telegraph-Cable Company, Dallas, Texas, arranged the sale.

J. H. BUNNELL & COMPANY, 32 Park Place, New York, have filed notice of increase of capital stock from $150,000 to $300,000, to cover proposed manufacturing expansion.

Death of Charles W. Jaques

Charles W. Jaques, veteran of the United States Military Telegraph Corps of the Civil War, died at Ashtabula, Ohio, on August 23. Mr. Jaques had a brilliant record for daring exploits as a telegrapher during the Civil War, and was held in high esteem by his comrades. In recent years he has been in charge of a successful insurance business at Ashtabula, where he made his home. He is survived by his wife, and a daughter Mrs. Rev. Charles Nauman, pastor of a church in New York.

GEORGE F. THODE, aged 83 years, died at West Bend, Wis., on July 8. Mr. Thode is survived by his wife, one son and two daughters. During the Civil War Mr. Thode was a United States military telegrapher, and was a brother of John T. Thode, who saw service in Tennessee during the war.

IN CUBA, during the month of March, 1920, the collections of the department of communications amounted to $250,126 as compared with $205,106 during the same period in 1919.

EVERY TELEGRAPH OPERATOR
Will Want a copy of This New Book

The book
of telegraph penmanship
Containing prizewinning
Specimens Submitted in
Contests recently participated
in by Railroad and
Commercial Telegraphers.

NOW READY FOR DELIVERY

In handsome library binding, containing eighty pages of text and fac-simile zinc etchings illustrating the penmanship of some of the most artistic teelgraph penmen in the country.
In addition to samples of the penmanship of famous old-timers, the book contains the twenty-four winning specimens submitted in the 1918 Telegraph Penmanship Contest conducted by the Railroad Man's Magazine.

THE PRICE IS $1.15 PER COPY

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253 Broadway, New York

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o. 18 NEW YORK, SEPTEMBER 16, 1920 Thirty-eighth Year

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Thomas A. Edison Operates a Morse Key

Telegraph Wire Once More Carries Signals Transmitted By the Famous Inventor.

On July 20, Thomas A. Edison again became a telegrapher for a few minutes when he transmitted by means of a Morse key a communication addressed to the telegraph fraternity.

A telegraph circuit was arranged between Mr. Edison's laboratory at Orange, N. J., and the executive offices of the Western Union Telegraph Company at 195 Broadway, New York.

perintendent of telegraph of the Baltimore and Ohio Railroad.

Standing, from left to right in the photograph, are: W. N. Fashbaugh, vice-president, Western Union Telegraph Company; Mr. Stephens, G. M. Yorke, vice-president, Western Union Telegraph Company; L. B. Foley, superintendent of telegraph, telephone and wireless, Lackawanna Railroad; L.

Listening to the Incoming Message Transmitted by Thomas A. Edison

At the receiving end of the circuit the instruments were mounted on the table illustrated in the accompanying picture. In the center, sitting, David Homer Bates is shown receiving the message from Mr. Edison. On Mr. Bates' left, is seated Mr. G. W. E. Atkins, first vice-president of the Western Union Telegraph Company, and on Mr. Bates' right is seated Mr. Charles Selden, late su-

McKisick, assistant to the president, Western Union Telegraph Company; E. P. Griffith, superintendent of telegraph, Erie Railroad; Thomas W. Carroll, general manager, eastern division, Western Union Telegraph Company, and Thomas E. Fleming, secretary and treasurer of the Old Time Telegraphers and Historical Association.

Mr. Edison's sending as reproduced in the tele

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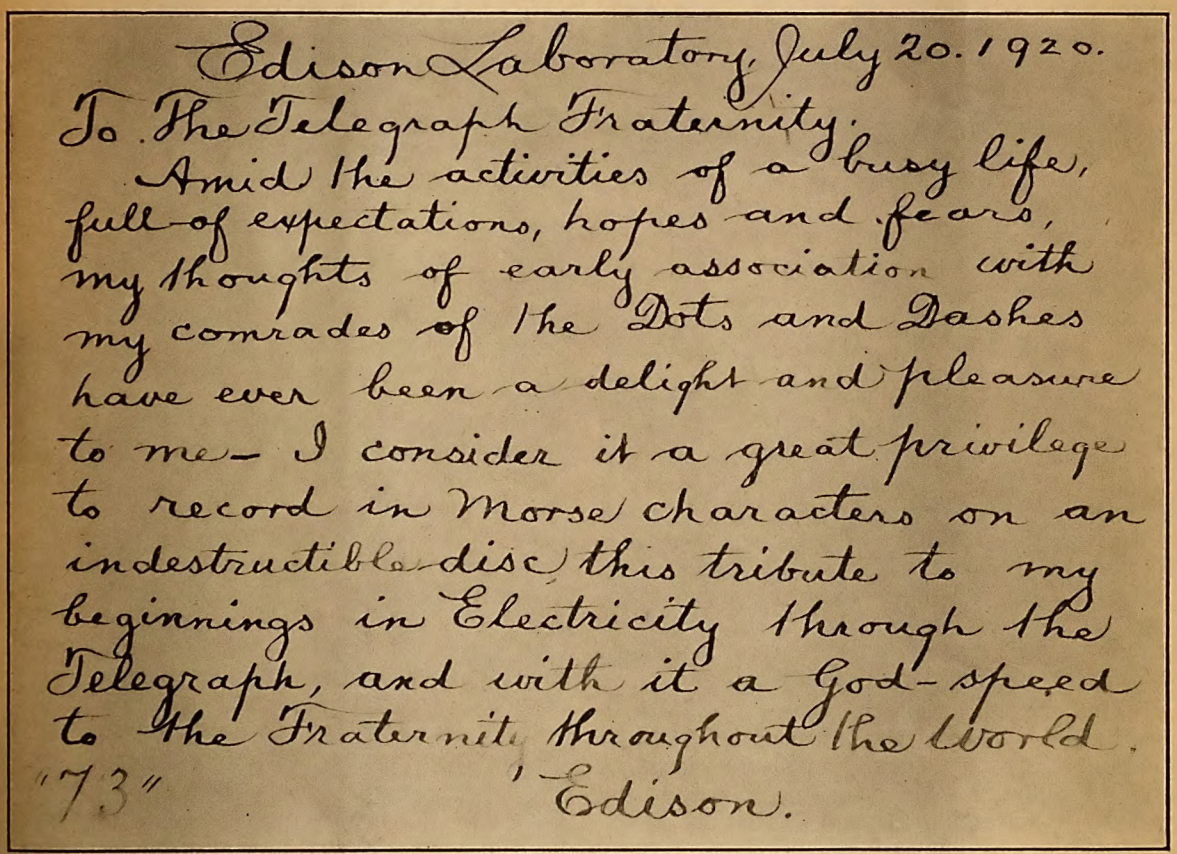
graph sounder, was at the same time recorded on a phonograph matrix from which disk records may be made.

A duplicate of the record was taken to the Toronto convention of the Old Time Telegraphers' and Historical Association, and the reproduction of Mr. Edison's sending at one of the sessions of the meeting was enthusiastically received by the large number of telegraphers in attendance.

It is planned to make records for phonographic reproduction of the Morse sending of other famous telegraphers.



Edison Laboratory, July 20. 1920.

To The Telegraph Fraternity:

Amid the activities of a busy life, full of expectations, hopes and fears, my thoughts of early association with my comrades of the Dots and Dashes have ever been a delight and pleasure to me— I consider it a great privilege to record in Morse characters on an indestructible disc this tribute to my beginnings in Electricity through the Telegraph, and with it a God-speed to the Fraternity throughout the World.

"73" Edison.

MR. EDISON'S MESSAGE AS COPIED BY DAVID HOMER BATES

Convention at Toronto, Ontario of The Old Time Telegraphers' and Historical Association

August 31, September 1 and 2

The convention is over and most of those who attended the 1920 Reunion of the Old Time Telegraphers' Association and the United States Military Corps are today either journeying homeward or continuing onward to some other select Canadian spot for the remainder of their regular vacation.

Singular as it may seem, there were some, very few, of course, who were disappointed in the convention—but only at the start. Some of the Toronto folks, the hotel men, for instance, when they heard that the Old Timers were coming to Toronto, imagined that the gathering would be made up largely of decrepit men and gray-haired ladies, most of whom had one foot in the grave and the other on a banana peel.

When the convention actually started, however, and those Toronto folks met dozens of interesting men and a host of charming ladies, they soon changed their minds, and when at the luncheon in the Pompeiian Room of the King Edward Hotel on Tuesday, the first day of the meeting, those Toronto folks heard the Old Timers sing, they decided at once that there was going to be just as much pep, just as much good-fellowship and just as much real enjoyment among the Old Timers as with any other convention that Toronto folks have had the pleasure of entertaining.

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The business meeting of the convention was well attended, ably handled and quickly over, as such affairs should be. After the business meeting a get-together luncheon was held followed in the afternoon by an automobile ride around the city, ending on the grounds of the Canadian National Exhibition. Here the city of Toronto entertained the convention at dinner, and later on by a wonderful performance in front of the mammoth grandstand, holding some sixteen or seventeen thousand people.

On Wednesday the entire day was given up to a trip by boat across the lake to Lewiston, then by trolley car to Victoria Park; luncheon, a ride on the Maid-of-the-Mist," another trip by trolley car down the Gorge route and back by boat to Toronto. While at Niagara Falls the delegates were photographed in a large group and many of those attending the convention took home with them as a souvenir a copy of this panorama photograph. Nearly everyone took the trip to the Falls. Those to whom the trip was new were so enthusiastic in its praise that they were good enough to say that it was just about as nice a day's outing as they had ever had. Of course, the wonders of Niagara are always new and the surging, rushing waters falling over this immense precipice of rock and then hurrying along to the great whirlpool rapids and on to Lake Ontario has the same charm, the same interest and the same fascination that it had yesterday, last week or last year, when some of us, perhaps, saw the great Niagara for the first time.

On Thursday the visiting members, piloted in groups by the ladies and gentlemen of the Toronto convention committees, visited again the Canadian National Exhibition. On Thursday, however, the time was spent in going through the various buildings containing exhibits of practically everything used in every-day life. In one building was the automobile show, where everything in the line of a motor vehicle from the tin Lizzie to the latest model of the Pierce-Arrow and Packard Sedan were being exhibited. In another building could be found the exhibits of various manufacturing plants of Canada; in another was seen the work of school children, of blind and maimed returned soldiers, and in still another could be seen goods actually in process of manufacture. Then, again, there was the Art Building, the Railway Building, the Government Building, the Dairy Building and many others.

Some of the convention delegates returned to the city after luncheon time, while others made a day of it and took in all of the best that the exhibition had to offer. Many of the ladies, true to the feminine disposition, spent the afternoon in shopping around Toronto's many well-stocked stores. In passing, it might be mentioned that Toronto has a department store second only to Marshall Field's of Chicago. In addition, Toronto has many specialty shops, all of which were of some interest to the convention ladies.

In the evening came the banquet, and again the King Edward Hotel threw open the Pompeiian Room for the entertainment of the Old Timers. A splendid menu was supplied and the service was excellent. In addition to the "eats," there were colored balloons, paper streamers, recitations, songs by the members and songs by the entertainers. There were speeches and then more speeches. Some were reminiscent, some were serious and many carried a touch of humor.

The crowning event of the evening was the showing of a lantern slide picture of Thomas A. Edison sending a message, another picture of a special committee receiving Mr. Edison's message, and still another lantern slide of the message itself. At the same time those present were given the opportunity of listening to the message as sent by Thos. A. Edison himself and recorded on an indestructible phonograph record. As an interesting side-light, it was announced that this record of Mr. Edison's sending is only one of a number that are to be gathered and retained in the archives of the Association.

The banquet, and with it the 1920 convention of the Old Time Telegraphers' Association and the United States Military Telegraph Corps came to an end with the singing by all those present of "Auld Lang Syne." Many of those attending the convention were good enough to say that they had had a most enjoyable time. Let it be remembered, however, that the weather man supplied three days of ideal convention weather; that Toronto is especially well equipped to entertain either large or small conventions. Let it be remembered also that the convention committee at Toronto enjoyed the three days of sight-seeing and good-fellowship as thoroughly as the visitors. Some day Toronto will wish the Old Timers to come again. Right now we must look forward to next year, when the convention will be held in that delightful and historical Southern city—Richmond, Virginia, under the leadership of C. W. Bradley, the president-elect.

Following are the names of those present at the Toronto convention, the members of the Toronto convention committee, and the names of those who so graciously attended and took part in the program at the convention banquet:

F. G. Adams, Baltimore, Md.; Mrs. L. C. Adams, Springdale, Pa.; Thos. Ahearn, Ottawa, Ont.; Wm. Allenbaugh, wife and son, Pittsburgh, Pa.; John F. Amend, Wilkinsburg, Pa.; Chas. A. Anderson, Newark, O.; Mrs. S. J. Armstrong and Mrs. Moore, Pittsburgh, Pa.; J. K. Babcock and wife, Toronto, Ont.; J. W. Baker, Montreal, Que.; R. A. Baker, Toronto, Ont.; W. G. Barber and wife, Toronto, Ont.; L. Behner, Avalon, Pa.; Thor. J. Benson, Chicago, Ill.; E. C. Bishop, Pittsburgh, Pa.; Senator W. C. Burton, Brooklyn, N. Y.; J. S. Calvert, Philadelphia, Pa.; W. J. Camp, Montreal, Que.; W. H. Canniff and wife, Cleveland, O.; J. A. Chapman, Philadelphia, Pa.; Jas. B. Christie, Trenton, Ont.; Miss J. Clarke, Toronto, Ont.; C. L. Clevenberg, New York, N. Y.; Geo. Collins and wife, Trenton, Ont.; Miss M. F. Corbett and Mrs.

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McCarthy, Detroit, Mich.; D. Crombie and wife, Toronto, Ont.; Rev. W. L. Cullen, Toronto, Ont.; Geo. Curry, Toronto, Ont.; J. L. Curry, Toronto, Ont.; F. J. Dayman and wife, Cleveland, O.; Chas. E. Davies and wife, Toronto, Ont.; C. W. Dawzy, Toronto, Ont.; Wm. J. Donnelly and wife, Philadelphia, Pa.; W. J. Duckworth and wife, Toronto, Ont.; T. E. Dudley, St. Catherines, Ont.; Miss L. J. Duncan, Pittsburgh, Pa.; R. H. Dunphy, Detroit, Mich.; R. F. Easson and wife, Toronto, Ont.; T. Fleming, Toronto, Ont.; Thos. E. Fleming, New York, N. Y.; L. B. Foley, New York, N. Y.; R. C. Folger, Philadelphia, Pa.; S. W. Geary and wife, Wilkinsburg, Pa.; J. J. Ghegan, New York, N. Y.; Hon. Chas. E. Graham, New Haven, Conn.; M. Green and wife, Brooklyn, N. Y.; John C. Greeno and F. L. Greeno, Kansas City, Mo.; E. P. Griffith, Jersey City, N. J.; H. Hulatt, Montreal, Que.; J. M. Hurty, Arlington, N. J.; C. C. Hamilton, Toronto, Ont.; Miss S. R. Haney, Pittsburgh, Pa.; R. H. Hathaway, Toronto, Ont.; Geo. H. Havens, East Cleveland, O.; F. M. Hawley, Toronto, Ont.; M. G. Hay, London, Ont.; D. E. Henry, Toronto, Ont.; George Hogarth, wife, son and two daughters, Toronto, Ont.; John Horn, Montreal, Que.; E. G. Hunter, Toronto, Ont.; Aubrey Hurst, Toronto, Ont.; J. P. Jaffray, Galt, Ont.; W. H. Jamieson, Chicago, Ill.; John E. Jenkins and wife, Buffalo, N. Y.; Leslie H. Jenks, Carthage, N. Y.; Geo. Joliffe and wife, Toronto, Ont.; D. Kelly and wife, Pittsburgh, Pa.; J. L. Kope and wife, Cleveland, O.; Mrs. Geo. H. Kendrick, Pittsburgh, Pa.; H. L. Kiskadden, Freeport, Pa.; P. J. Lally and wife, Cornwall, Ont.; H. J. Lillie, Toronto, Ont.; J. E. McCann, wife and daughter, Montreal, Que.; A. C. McConnell, Toronto, Ont.; E. C. McConnell and wife, Detroit, Mich.; L. B. McFarlane, Montreal, Que.; S. B. McMichael and wife, Toronto, Ont.; John G. McNerny and wife, Buffalo, N. Y.; W. I. McQuown and wife, Wilkinsburg, Pa.; J. F. McTaggart and wife, Toronto, Ont.; James Matthews, Acton, Ont.; G. Matthews and wife, Toronto, Ont.; T. A. Mears, wife and M. Woodard, Detroit, Mich.; D. C. Moon and wife, Cleveland, O.; Wm. R. Morris and wife, Trenton, N. J.; J. Moxam and wife, Detroit, Mich.; G. E. Murphy, New York, N. Y.; W. D. Neil, Toronto, Ont.; O. H. Newell and wife, Columbus, O.; Mrs. S. E. Nichols, Buffalo, N. Y.; Chas. Noble and wife, Montreal, Que.; Geo. Paton and wife, Toronto, Ont.; A. Peden and wife, Toronto, Ont.; Geo. D. Perry and wife, Toronto, Ont.; Geo. Phemister, Niagara Falls, Ont.; Dr. M. C. Polak and wife, New York, N. Y.; E. Pope, Quebec, Que.; G. F. Ramsey and wife, Columbus, O.; Harvey D. Reynolds, Buffalo, N. Y.; A. L. Rice and wife, Pittsburgh, Pa.; Hon. G. D. Robertson, Ottawa, Ont.; G. M. Robertson and wife, St. John, N. B.; Thos. Rodger, Montreal, Que.; J. B. Rogers and wife, Toronto, Ont.; Roderick M. Ross and two daughters, Detroit, Mich.; J. A. Roy and wife, Toronto, Ont.; C. H. Rugg and wife, Pittsburgh, Pa.; F. J. Sherrer and wife, Tarrytown, N. Y.; W. J. Schlueter, Preston, Ont.; J. J. Seitz, wife and daughter, Toronto, Ont.; Andrew P. Sell and wife, Philadelphia, Pa.; Edgar A. Smith, Somerville, Mass.; W. R. Smith and wife, Aspinwall, Pa.; A. Stevens and wife, Baltimore, Md.; J. B. Stewart and wife, Pittsburgh, Pa.; A. L. Tinker, New York, N. Y.; Andrew G. Wallace, Philadelphia, Pa.; G. H. Walters, Toronto, Ont.; Geo. Watt and wife, Toronto, Ont.; Arthur E. Way, Toronto, Ont.; H. W. Wedge, Jersey Shore, Pa.; F. J. Weis, wife and daughter, Belmar, N. J.; Peter Weitz, wife and daughter, Johnstown, Pa.; Edgar Winters, Montgomery, Ala.; Mrs. Ada E. Wolfe, Buffalo, N. Y.; Allen Woodle, Buffalo, N. Y.

In the Early Days of Telegraphy

In the early days of the telegraph, there were a number of competing companies. Each company, in building up its system of lines, aimed to become the "big" company. The result was that non-paying branch lines were extended into out-of-the-way places in order to increase the total number of offices reached by a given company.

There may have been occasions when linemen of rival companies passed by breaks in the other fellow's line which could have been repaired without much extra work, and as a neighborly act—to be reciprocated on occasion.

It is a matter of record that while the United States Telegraph Company had lines throughout Pennsylvania there was a spot where the company's wire to a small town was on the same side of the roadway as two Western Union wires. One day the United States wire became crossed with a Western Union wire, and for a few minutes the operators of the rival concerns were in communication. It was not long, however, before the Western Union man had the situation sized up; and, simulating the call of the rival company's test office, instructed the operator at that company's office up State to "open this wire and leave it open until advised to close." Inasmuch as it was the only wire the poor fellow had it would have been interesting to have seen the subsequent official correspondence which resulted from the delay to business; for, although when he opened his key he cleared the Western Union wire he, at the same time, shut himself off from communication.

He Was Not a Colored Man, Either!

Combining social and business affairs in one telegram may be all right, but it is a good idea to study carefully the wording and to be prepared for consequences. Recently a commission merchant sent a telegram to a business man in a distant city, in which the "ten words" were used up in this fashion: "Your father was here yesterday. Chickens are very scarce today."

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THE SUBMARINE CABLE AND SOME OF ITS SYSTEMS

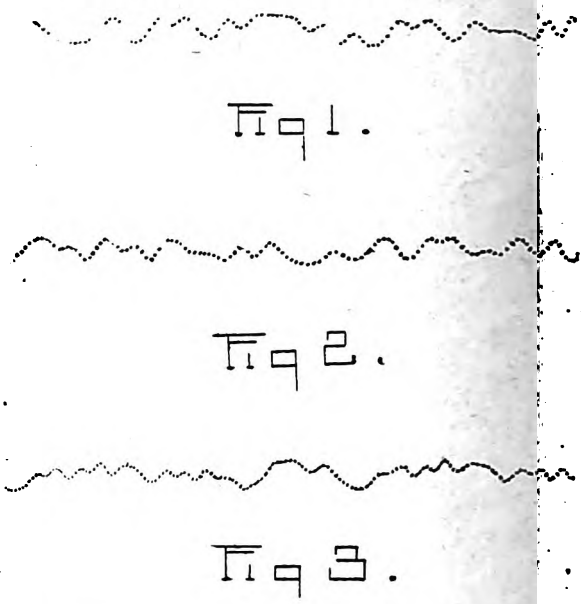
(*Continued from September 1 issue*)

The Dixon Amplifier (or Magnifier), the invention of Thomas B. Dixon, which has been patented in the United States and foreign countries, has been in practical operation on one or more of the Atlantic cables for several years, in some cases having been employed to operate the siphon recorder directly and in others to operate a cable relay, repeating into a second cable. This amplifier, with its accessory features, is of peculiar interest because of two highly important facts, 1, speed capacity; 2, ability to work successfully under adverse conditions against disturbances, etc., with a minimum of interruptions and time loss, and general reliability.

In speed capacity, it has broken all trans-Atlantic records, so far as known, having handled all classes of actual traffic on a cable having a normal recorder speed of one hundred and ninety letters per minute at speeds as high as from four hundred and thirty to four hundred and fifty letters per minute, a net speed gain of over one hundred and twenty-five per cent., working in single direction on duplex connections. A sample of actual received tape at a speed of four hundred and thirty letters per minute is shown in Figure 1. It has handled actual traffic, working duplex, on a cable having a normal recorder speed of one hundred and ninety letters per minute at a speed as high as three hundred and thirty-eight letters per minute, a net speed gain, duplex, of seventy-eight per cent.

In experimental single direction working on duplex connections on a cable having a normal speed capacity of one hundred and ninety letters per minute signals good enough for ordinary traffic were demonstarated at a speed of four hundred and ninety-one letters per minute, a net speed gain of one hundred and fifty-eight per cent., a sample of the received slip at this speed being shown in Figure 2. Figure 3 shows a sample of tape of signals obtained at a speed of six hundred and thirty-six letters per minute, on a trans-Atlantic cable with duplex connections and working in a single direction. The net speed gain at six hundred and thirty-six letters per minute as compared with the normal speed of the cable of one hundred and ninety letters per minute amounts to two hundred and thirty-four per cent.

It is to be noted that the signals shown in Figure 3 are not claimed to be commercial signals, and are interesting only from the standpoint of being a demonstration of speed possibilities scarcely even dreamed of theretofore by even the boldest prophets in the field of cable operation. They are very interesting indeed from this standpoint, since cable men know well that the speed limit of a cable is always reached when the "reversals," i. e., signals having elements of positive and negative polarity succeeding each other, fail to get through, the positive element tending, as the speed increases, to obliterate the negative element, and vice versa. It will be seen that in this sample the reversals got through in fine shape, and Mr. Dixon states that it is his belief, and the expressed belief of expert cable men witnessing the experiments, that establishing practical trans-Atlantic cable working at speeds exceeding six hundred letters per minute is merely a matter of elimination of disturbance and adjustment of apparatus and the provision of magnetic shunts of proper values, the magnetic shunts employed by him



hitherto being of standard construction designed for ordinary recorder working, and not having been specially designed as should be the case, for his apparatus.

The reliability of the Dixon amplifier, its capacity to work steadily under varying conditions with a minimum loss of time for adjustments, has been demonstrated in many ways and at many times, and it may be particularly mentioned here that on several occasions when earth-current disturbances made impossible the working of other cables terminating in the same office as the cable equipped with the Dixon apparatus the latter worked steadily and reliably.

Referring now to the apparatus of the amplifier, this consists as at present installed of the amplifier proper and accessory means for eliminating effects of disturbances, caused by imperfect balance in duplex operation and by other disturbances in the cable

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circuit. It may be stated, however, that Mr. Dixon has invented further duplex improvements which he believes will make it possible to work duplex at the highest speeds otherwise obtainable, and which TELEGRAPH AND TELEPHONE AGE shall describe in a future issue.

In the Dixon amplifier selenium cells influenced in their electrical conductivity by light variations controlled by the cable signaling currents are utilized to effect the amplification of received signals on a secondary receiving instrument placed locally in the selenium circuit; and an arrangement of condensers and inductances shunting the main and local receiving instruments are employed to reduce to a minimum the effects of disturbances, this arrangement also serving the purpose of greatly assisting in readily adjusting the apparatus so as to give the received signals proper shape and render them easily legible to the operator.

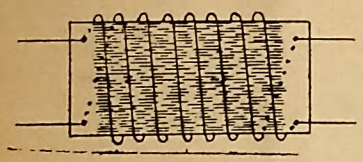

Fig 4.

A selenium cell is illustrated in Figure 4. It consists, as usually constructed, of two parallel wires, preferably platinum, wound close together but so as not to touch each other, in a single layer over a flat base of some non-conducting material such as steatite, and coated over with a thin film of selenium, which is first melted and spread as evenly as possible over the surface and then subjected to an annealing process, after which the cell is ready for use. The electrical current enters one wire, passes through the selenium coating to the other wire, the two wires being connected to the battery terminals. Such a cell may have an electrical resistance which in the dark is many times as great as when exposed to light, the reduction in resistance due to illumination being in general proportional, within certain limits, to the intensity of the illumination. Selenium cells, according to the process of manufacture, may be so constructed that their resistances vary quickly or slowly under a given variation in illumination, a quality which is most desirable from the standpoint of a universally applicable cable amplifier, since by selecting cells that are not too quick acting and properly adjusting the light intensity it becomes possible to work cables affected by bad balance or other disturbance conditions much more readily than where the quicker acting cells are employed.

The general arrangement for the light control usually employed in the Dixon amplifier is shown in Figure 5. The source of light 1 is preferably a nitrogen filled tungsten lamp having a single straight filament suspended vertically, around which are placed segmental condensing lenses 2, which serve to divide the light into a number of separate light pencils 3 (the axes of the pencils only being indicated), narrow and rectangular in cross-section, which (excepting the central pencil which does not require a prism) are concentrated by means of prisms 4 and focusing lenses 5 upon the thin rectangular galvanometer mirror 6, which is suspended by fine phosphor-bronze wire so as to be rotatable about its axis within certain limits by the movements of a coil of wire 7, to which it is connected by quartz fibres 8. The coil, also suspended by fine phosphor-bronze wire, is placed in a magnetic field (not shown), and through its windings the cable circuit passes, the mirror thus being made to follow, owing to the pull of the quartz fibres, the movements of the coil in response to signals. The light pencils, 3a, reflected from the mirror 6, first impinge upon strip reflectors 9 and are thence reflected at proper angles as pencils 3b to coincide in position on the selenium cells 10, so that as the mirror 6 turns to right or left on its axis the light pencils, coinciding in position on the cells, move correspondingly across the surface of the cells, the usual arrangement being such that each cell is, when the light pencils are in the central or zero position, half illuminated and half in the dark (except as it may be slightly affected by stray light). Concave reflectors 11, placed at the rear of the light source, add considerably to the light intensity of each of the pencils. Four cells or groups of cells are usually employed, being mounted in a moisture proof case having a glass front and connected together so as to form the four arms of a Wheatstone bridge and in such manner in relation to the light that a movement of the light in either direction influences the cells through varying the areas of their illumination in all four arms of the bridge simultaneously and so as to cause a flow of current of similar direction in the cross-wire, in which is placed the local (secondary) receiving instrument. The light pencils at the point of impingement on the selenium cells are made of substantially the same shape and size, all being much higher than wide and

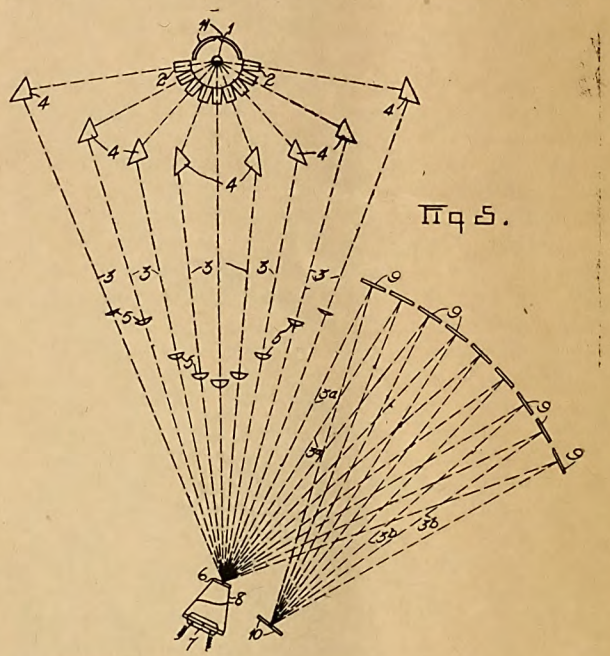

Fig 5.

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rectangular in cross-section, by making the condensing lenses 2 higher than wide and by providing lenses 5 of different focus, since the light pencils have different total lengths from the source of light to the selenium cells, and if the lenses 5 were all of

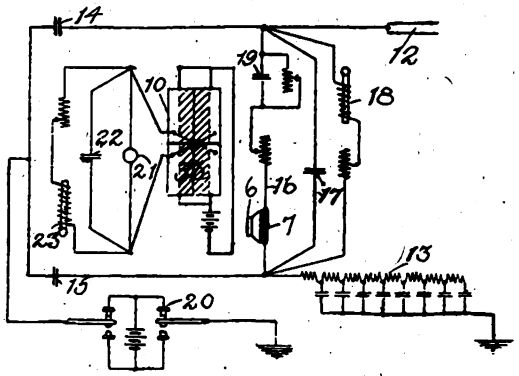

Fig 6.

the same focus the cross-section of the longer light pencils at the point of impingement on the selenium cells would be greater than that of the shorter pencils, a condition not desired.

The importance of employing a plurality of light pencils in lieu of employing a single light pencil in apparatus of this type will be apparent when it is stated that while the illumination obtainable from a single light pencil is sufficient for results up to a certain point—the Dixon patents also covering the single beam arrangement—the efficiency is enormously increased where a plurality of light pencils concentrated on the cells as above described and moving in unison across the surface of the cells is employed. This is true because with the plurality of pencils the illumination factor may be readily adjusted to meet any condition found in practice; and the electrical energy varied in the local circuit, and hence the amplification, is directly proportional to the surface of the selenium varied and the intensity of illumination; two pencils, in general, exerting double the illuminating power of a single pencil, and so on. Also, the more intense the illumination, the sharper and better defined the signals at high speeds. The sample of slip shown in Figure 3 was obtained with an arrangement of apparatus comprising forty-five light pencils, each pencil having a length of approximately fifteen feet between the mirror 6 and the selenium cells, while that in Figures 1 and 2 was obtained with an arrangement of apparatus having twenty-eight light pencils, the length of each moving pencil being approximately eleven feet. Naturally, with a given movement of mirror 6, the longer the light pencils, the greater the movement of the light at the point of impingement upon the selenium cells, and consequently, the greater the variation in resistance (assuming the same light intensity at the cells for an arrangement of long pencils as for one of short pencils) of the cells, and resulting signal amplification, which means corresponding speed capacity.

Consequently, the thinner the condensing lenses 2, the greater the number as well as the length of pencils obtainable with a given radial distance between the source of light and the lenses. In the figure, for sake of simplicity of illustration, the half-circle filled with the condensing lenses is divided into only nine lens sections, whereas in practice it may be readily divided so as to comprise, if required, from forty to sixty segmental condensing lenses.

In certain arrangements of the Dixon apparatus not yet, however, actually put into practical operation, the mirror 6 is made with a double reflecting surface, so that without adding to the weight and inertia of the mirror double the amount of light can be controlled, with consequent doubling of amplification obtainable with a single reflecting surface mirror.

In Figure 6 is shown the well-known Wheatstone bridge arrangement of receiving circuits and instruments at one end of a cable circuit with the local selenium cell arrangement added; 12 being the incoming cable end, 13 the artificial line, 14 and 15 block condensers, commonly provided in the main line and artificial line, 16 the cross-wire of the bridge wherein the main coil 7 of the receiving apparatus is located, and 17 capacity shunted around coil 7 and 18 inductive resistance also shunted around coil 7; also is shown the usual receiving shunted condenser 19 in the cross-wire 16 of the bridge. Suitable regulatable non-inductive resistances are provided, as is customary. The usual transmitting apparatus 20 connected to the apex of the bridge is also shown. Selenium cells 10 are shown arranged to be actuated by light pencils projected upon them by the reflector 6 actuated by the coil 7, and 21 designates the local receiving instrument operated by the selenium cells' circuit. The shaded area 3b indicates the cross-section of the light pencils, and assuming the normal resistance of the four cells forming the arms of the Wheatstone bridge to be equal, with the light in the normal, which is the central or zero position, each cell having half its surface area illuminated as shown in the figure, no current flows through the secondary receiving instrument 21, but will flow through this instrument in the one direction or the other making dot or dash signals, according as the light pencils are deflected to the one or the other side of zero. A capacity 22 is shunted around this local receiving instrument 21, also inductive resistance 23 likewise shunted around this receiving instrument. By giving proper values to the capacity 22 and to the inductive resistance 23 a much higher value can be given to the capacity 17 than would be practicable with that capacity used alone, and the result following the employment of the two capacities and inductances, one set shunting the main receiving instrument and the other set shunting the secondary receiving instrument, is that under certain bad disturbance conditions without the capacity 22 and inductive resistance 23 the signals would be unreadable even at quite low speeds, yet with the shunted capacity 22 and inductive resistance 23, together with a condenser 17 of the higher capacity, perfect signals may be produced; in fact, the effects of the disturbances mentioned are for all practical purposes eliminated.

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A Large Private Telegraph Wire Establishment.

Thirty-five Men Required to Operate Wires and Instruments.

Telegraph departments maintained by brokerage firms and financial houses in the Wall Street district of New York, in equipment and operating staff, are as extensive as main telegraph offices maintained by the commercial telegraph companies in the large cities of the country.

One difficulty about the telegraph office situation in Wall Street is that on May 1 and on November 1 of each year many office leases expire at the same time. This places a large burden on the plant departments of the telegraph companies, who, of course, are required to set up the dozens of transferred telegraph offices, and to dismantle the plants in offices vacated.

The year 1920 has been a strenuous period for the engineers, foremen and wiring gangs, whose job it is to shift telegraph offices from one office building to another. It has been estimated that on May 1, this year, there were 75 per cent. more office moves made than in any previous year on the same date.

Aside from the large amount of telephone line and switchboard transfer work that was under way in one building alone—No. 52 Broadway—thirty-six Morse telegraph lines were transferred from various other buildings to that location. There are perhaps 500 office buildings in lower New York which have from one to fifty private wire telegraph installations—some of the individual installations having as many as fifty circuits.

These figures give an idea of the extent of the work the telegraph and telephone companies had on their hands while shifting of tenants from one office building to another was under way.

The accompanying illustration shows the wire room of Clark, Childs and Company, Brokers, 165 Broadway, New York.

The firm uses circuits leased from the American Telephone and Telegraph Company, and the work of arranging new quarters and of transferring the equipment devolved upon the staff of that company.

The operating room illustrated is 40 by 23 feet, and the E shaped table in the center has capacity for twenty-five operating positions. The equipment comprises eighteen standard telegraph circuits connected through a twenty-line springjack switchboard (A. T. & T. Co.); morsegraph unit with a 20-jack switchboard; one Telautograph installation; twelve Western Union pony wires; five stock-tickers; one news ticker, and five electric time stamps.

Thirty-five men are required to operate the instruments and lines. A. P. Velie is chief operator, and E. A. Goshert, assistant chief operator of the office.

———o———

THE OLD WIRE CHIEF SAYS: "When you are full of wrath, and, as a consequence, on the brink of verbal quicksands, you may set the brake grinding in time if you whisper to yourself, quickly, 'I am excited.'"

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EDITORIAL COMMENT

Radio Consolidation

The recent tie-up of interests of the Radio Corporation of America and the General Electric Company, and the later acquisition by the American Telephone and Telegraph Company of a minority interest in the Radio Corporation, for the purpose of furthering the commercial development of radio telegraphy and radio telephony, has been followed by another consolidation which means much to the future of radio.

The Westinghouse Electric and Manufacturing Company and the International Radio Telegraph Company have completed arrangements whereby the vast resources of the Westinghouse Company are to be available for the building up of a radio organization which will insure continuation of competitive effort in this field.

The International Radio Telegraph Company is a going concern. It stands well commercially and has a staff of technical and commercial officers who, individually, stand high in the profession. The company controls the inventions of R. A. Fessenden, which are numerous and valuable. The company has done a large amount of work in designing, constructing and installing radio equipment for airplane service, and for ship and shore stations. Its commercial shore stations, operated since the Navy Department released control of long distance plants, have been managed along thoroughgoing commercial lines, and the service rendered has been highly satisfactory.

When this new consolidation has been completely organized American made radio equipment should promptly find its way to all parts of the globe.

Airplanes Wreck Wire Lines

The growing frequency with which telegraph and telephone trunk lines are being wrecked, or partly wrecked, by airplanes; proclaims the fact that the business of aerial transportation—like any other new art—must, apparently, for a time trespass upon the property and rights of other industries before the new thing becomes safely established.

It would seem, though, that with aerial transport grown to a point where it is used to carry mail on regular schedules, that something should be done toward mapping out routes where forced landings would not result in damage to other property.

We may be reminded that even in railroad transportation, where trains travel over a pair of rails which always remain in the same place, it is necessary to provide overhead and tunnel crossings for foot and vehicle traffic in order to avoid mishap. The cases are different, however, as such crossings are provided only where crossing traffic is very dense, and when a train stops to allow a brakeman to pack a hot-box it does not drop bodily upon someone's pergola. Also, in getting under way again it does not foul a squatter's clothes-line, or decapitate his shade trees.

On July 17 last, at 7.20 p. m., about one mile east of Chesterton station on the New York Central Railroad, an airplane pilot in leaving the ground caught the tail of his machine in the wires of the main telegraph lead, resulting in the breakage of all wires on the top cross-arm, and these wires, falling upon the wires underneath, caused a general mix-up of circuits. The 'plane then crossed the track and one wing came into contact with a telegraph pole, knocking it down and causing all circuits to fail.

On August 27 last, near Sheldon, Ill., on the Chicago Division of the C., C., C. & St. L. R. R., an airplane fouled the telegraph lead, tearing down all wires. In this instance the aviator was killed.

There have been other recent wire interruptions due to airplane landing or rising difficulties—one on the Long Island Railroad and one on the Erie Railroad. The time is at hand when airplane routes must be definitely mapped out and spots clearly marked where machines should not land if under control.

Titles For Chief Operators

In the service of the Western Union Telegraph Company there has been for some time past dissatisfaction with the title of "attendant" as covering the assigned duties of the operating experts who handle repeaters, wire testing, multiplex apparatus and switchboards. Until a few years ago it was customary (and still is the custom in the service of the Postal Telegraph-Cable Company) to classify the men in charge of wire and apparatus management as assistant chief operators; specifying, when necessary, in which department the assistant chief held sway.

The titles complained of are such as "testboard attendant," "repeater attendant," etc. The main objection is to the use of the word "attendant."

The experience and expertness which should be required on the part of men occupying these advanced positions in the service would seem to transcend any mantle of dignity which it may be thought is embodied in the word "attendant."

Years ago there was employed the title of Circuit Manager, which possessed both dignity and an unmistakable definition of authority and responsibility. We believe this title could to advantage again be brought into use.

Position designations such as Assistant Chief Operator, Repeater Department; Assistant Chief Operator, Multiplex Department; Assistant Wire Chief, etc., undoubtedly carry a sensible shade of dignity; are not cumbersome, and would remove a grievance based upon the purely human desire for recognizable professional status.

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Student's Course in Technical Telegraphy

No. 12

SWITCHBOARDS—*Continued*

A type of main line switchboard in service at many offices of the Postal Telegraph-Cable Company, and in offices of lines connecting with the Postal company, is illustrated in Fig. 28. The unit shown in the figure accommodates six line wires and six sets of operating instruments.

At the top of the illustration is shown in cross-section one strip, or row, of pinjacks, with the "in" and "out" line-fuse shown at the extremities. Between the fuses and the first pinjack connection on each side is shown a lightning arrester unit of the carbon block with mica separation type. The carbon block towards the pinjacks is in contact with a metal strip which is in turn connected to earth.

The black sections of the pinjacks, in each case, represents insulation, while the light sections are of brass. The pinjacks are fastened in a strip of glazed porcelain about one inch in width.

The view at the top shows the course of the main line circuit from the point where the wire enters the office from one direction, through the pinjack contacts and fuses to the point where the line leaves the office to the pole line in the opposite direction.

Two of the pinjacks are looping jacks; one to cut-in east, the other to cut-in west. Two of the jacks are patching jacks, east and west, and the remaining two jacks are for grounding purposes, east and west.

Where this type of switchboard is in use the following directions apply to its operation:

To cut-in, or loop an instrument upon a line wire: Place the instrument plug in one of the jacks of the wire it is desired to loop into, under the word "loop" in the brass guide plate. The cords used for this purpose have two-wire conductors, and a double-plug on each end.

To open a wire: Place a solid plug in the jack of the wire it is desired to open, under the words "open, or patch," in the guide plate. The solid plug has no cord attached to it.

To ground a wire: Use the same plug as for opening, but place it in the jack under the word "ground" in the guide plate. If a grounding plug and an opening plug are used on the same side of a wire at the same time, the wire will be opened on that side and grounded on the other. Looping, opening, or grounding may be done north, south, east or west, according to which jack of the two provided for that purpose is used, in accordance with the marks on the guide plate.

To patch a wire: Use a cord with a solid plug on each end. If it is desired to patch No. 1 wire, west, to No. 2 wire, east, place one plug in jack No. 1 west under the words "open or patch" in the guide plate, and the other plug in jack No. 2 east under the words "open or patch." All other patches are made in the same way.

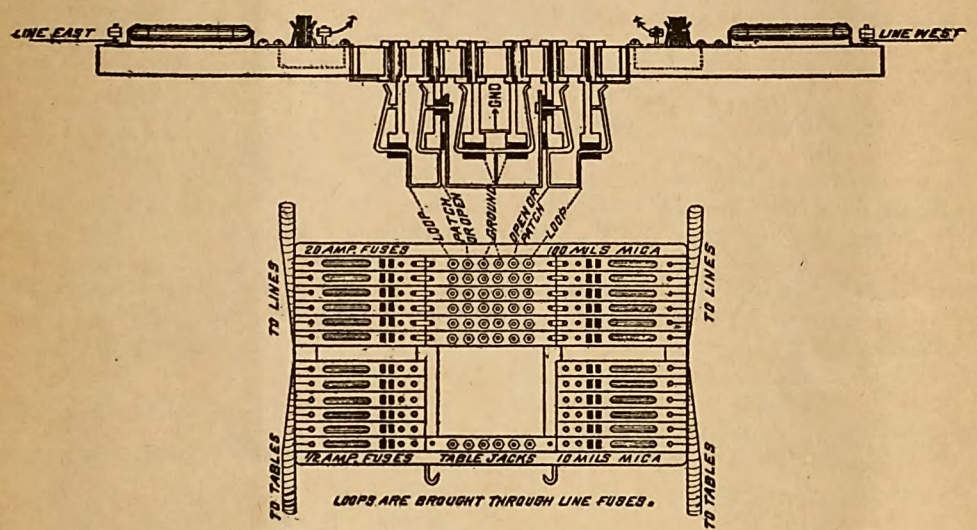

FIG. 28

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To connect a loop into a main line wire: Loops are brought to the switchboard in the same manner as line wires; that is, one side of the loop comes in at each side of the board. Use a double cord with a double, or looping plug on each end. Place one plug in a jack of the loop under the word "loop," and the other plug in a jack of the line under the word "loop." Another method of doing the same thing is: Use single conductor cords and patch one side of the loop to one side of the line, and the other side of the loop to the other side of the line, using the patching jacks as explained under "To patch a wire." When necessary to place more than one loop on the same line, connect the loops together, using a double conductor cord from a looping jack of one loop to a looping jack of the other loop. Then connect the line to one of the loops as described in the foregoing.

All of the fuse and switchboard connections of a wire can be bridged out (to test fuses, jacks, etc.) by using a single cord, placing one plug against each of the line terminals at the line side of the fuse blocks.

A double plug attached to a double conductor cord connected with the office instruments, is inserted in a looping jack when it is desired to cut the instruments in circuit.

It is well for operators and telegraph electricians to become familiar with the operation and construction of all forms of switchboards. For that reason we are describing in this series of articles, boards in service in all parts of the country and in the service of all commercial telegraph companies and in railroad service.

We have already received a number of sets of examination papers as called for in our August 16 issue. In the main the answers to questions show that students are following the instruction closely.

(To be continued)

THE FIRST TELEPHONE EXCHANGE on the Pacific Coast was established in San Francisco on February 18, 1878. The first exchange in the State of Oregon was established in Portland on June 18, 1878. The first exchange established in the State of Washington was installed in Seattle on March 9, 1883.

Communication Engineering Graduates

Signal Corps officers who were detailed to Sheffield Scientific School, Yale University, during the academic year 1919-1920, for advanced training in communication engineering, and who have recently been assigned to Army posts, include: Captain J. H. Hinemon, to West Point as Signal Corps instructor; Captain C. M. Milliken, to Camp Benning, Georgia, as Signal Corps officer; Captain R. E. McQuillan, to Camp Alfred Vail, N. J., as instructor; Captain C. M. Sawyer, to Camp Vail, N. J., as instructor in the research laboratories, and Captain S. M. Walmsley to the office of the Chief Signal Officer of the Army, Washington, D. C.

H. M. Turner, assistant professor of electrical engineering, Yale University, had charge of the instruction work.

Who Was It?

A wire chief who has charge of circuits extending throughout the State of New Jersey reports that recently he had considerable difficulty working a certain way-wire, due, perhaps, to poor line-insulation. A new operator at a way-office had been listening to the chief's instructions to a lineman, and to his remarks about the poor working of the circuit. Being a helpful and an industrious chap, the operator thought over the situation to see if there was not something he could do to improve matters. Sure enough, he thought of something—calling the test office hurriedly the young man asked the chief: "Is the line better now? I put in a new sounder."

The "Sender" Would Not Adjust

It was a rainy day—the circuits were almost unworkable. The little lady who copies the telegrams received at a small summer resort office was having her share of difficulty sorting out and properly combining into words the dots and dashes that were being transmitted to her from the main office in Boston. After putting up with such conditions as long as any bright girl should be expected to, she remonstrated with the man at the battery end of the wire in the following unequivocal terms: "I cannot read you. You simply must adjust."

S. O. S!

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Write for Information
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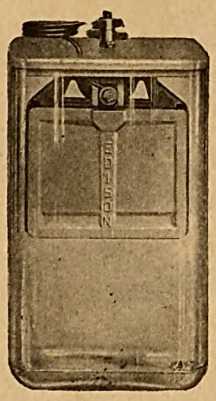
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

CABLE CIPHER CODES

We have made the subject of cable cipher codes a study for over thirty-five years. There are many hundreds of codes on the market that have been offered to the public at one time or another. We are familiar with the most prominent of them. This publication is headquarters for all cable codes. Many telegraph managers direct their inquiries for information on the subject of codes to the publisher of a particular code, who usually answers that he never heard of the book for which information is sought, but his own code will, no doubt, meet every requirement. As we deal in all codes without favoring any particular one, we are naturally headquarters for the different code books and are, therefore, in possession of information concerning most all of them. Bear these facts in mind when you have inquiries from your customers for codes, and direct your orders to

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The Railroad
TELEGRAPH AND TELEPHONE

ELMER RICHARDS

Superintendent of Telegraph, St. Louis Southwestern Railway

Elmer Richards, superintendent of safety on the St. Louis Southwestern, with headquarters at Mt. Pleasant, Tex., has been promoted to superintendent of telegraph, with headquarters at Tyler, Tex. Mr. Richards was born at Bowling Green, Mo., on May 20, 1864. He entered railway service in 1880 as a telegraph operator with the Chicago & Alton.

For the following four years he served as a telegraph operator with the Wabash, the Atchison, Topeka & Santa Fe, and the Western Union Telegraph Co. In October, 1884, he entered the service of the Cotton Belt as manager of the telegraph office at Pine Bluff, Ark. He was promoted successively to train dispatcher, assistant chief dispatcher, chief dispatcher and train master, and in January, 1895, became general manager of the Louisiana & Arkansas. One year later he was appointed train dispatcher on the Chicago and North Western, with headquarters at Boone, Ia. He was appointed a dispatcher on the St. Louis-San Francisco with headquarters at Springfield, Mo., in 1901. He re-entered the service of the Cotton Belt as chief dispatcher, with headquarters at Mt. Pleasant, Tex., in 1902, and was promoted successively to train master, assistant superintendent and superintendent. During federal control, Mr. Richards was assistant superintendent of safety under Federal Manager A. Robertson, with supervision also over the Missouri Pacific, the Cotton Belt and the Louisiana & Arkansas. With the return of the railroads to private control, he became superintendent of safety on the Cotton Belt, which position he held at the time of his recent appointment.

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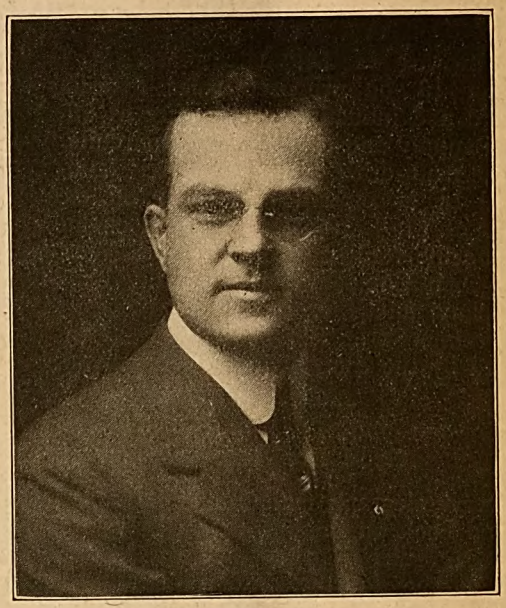
H. L. Graham, wire chief, Baltimore and Ohio Railroad, Jenkins, Ky., has in operation on his section of road a complete selective ringing telephone service, recently installed.

Telegraph and Telephone Division of the American Railroad Association, J. F. Caskey, Chairman. Address, Lehigh Valley Railroad, South Bethehlem, Pa.

R. R. BACON

Inspector, Algoma District, Canadian Pacific Railway Company's Telegraphs

Mr. Bacon, whose photograph is reproduced herewith, is another Canadian telegraph man who has made substantial progress in the business by virtue of continuous study and close application to the work in hand.



R. R. Bacon

He was born at Walkerton, Ontario, on March 25, 1885, and at twelve years of age secured employment as messenger boy in the services of the Great North Western Telegraph Company, at Huntsville, Ontario. Within a short time he learned telegraphy and worked at Huntsville and other points as operator in the service of that company until the year 1906. In the latter year Mr. Bacon entered the service of the Grand Trunk Railway at North Bay, Ontario, where he remained one year, and then took service with the Canadian Pacific Railway Company's Telegraphs, as night chief operator at North Bay. Later he was advanced to the position of chief operator, remaining there until he was appointed inspector on the Lake Superior Division, with headquarters at White River, Ontario. This promotion came to him in the year 1915.

Mr. Bacon has had charge of the work of installing equipment in many of the offices between North Bay and Fort William which have been remodeled in recent years. On the Lake Superior Division he

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has installed the equipment necessary to establish telephone train dispatching service.

Although circumstances compelled Mr. Bacon to leave school at an early age, from the beginning he realized the value of education and of knowledge of the technical side of telegraphy and telephony, and during the past thirteen years he has been a constant student of books and papers dealing with these subjects.

MRS. FLETCHER, wife of John Fletcher, superintendent of traffic, Western lines, C. P. R. Telegraphs, died at Janesville, Wis., on August 25. Mrs. Fletcher was a daughter of Captain Ransford Smith, a Civil War veteran. She was a woman of high intellectual attainments and was held in high esteem by all who knew her.

Electrical Hazard Rules—State of North Dakota

A hearing was held at Bismarck, N. D., on September 13, on proposed rules covering electrical hazard and inductive interference as affecting electrical supply and communication circuits.

The main draft of the set of regulations was prepared by a committee of electrical experts composed of M. J. Hansen, telegraph engineer, Northern Pacific Railroad; C. E. Winn, Western Union Telegraph Company; R. H. Fair, Bell Telephone Company, and four representatives of the electric power interests. The regulations are to be administered by the State Railroad Commission.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE

253 Broadway, New York.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

Data Sheet Service Solves Brush Problems

The National Carbon Company of Cleveland and San Francisco has recently increased the scope and efficiency of the Columbia Data Sheet Service for users of motors and generators, so that they may now be assured of absolutely correct brushes for these machines.

The data sheet furnished has twenty blank spaces in which the user indicates whether the brushes are needed for a generator, motor or rotary converter, also the service for which it is used, whether the current is direct or alternating, the name of the manufacturer, the type and serial number of the machine, voltage, capacity, load, measurements and so on.

From these data in connection with exhaustive laboratory tests it is possible for the National Carbon Company to furnish Columbia Pyramid Brushes best suited for the exact operating conditions. Through this service of investigation, analysis and specification, it is possible to guarantee satisfaction with these brushes. The service is at the command of any user, no matter how many or how few units he has.

The Morse Elm

The historic Morse elm tree which for many years has stood at the corner of 14th Street and Pennsylvania Avenue, Washington, D. C., has at last succumbed to the encroachments of asphalt pavements, and is soon to be taken down. The tree was named after Professor S. F. B. Morse, the inventor of the telegraph, and has weathered the storms of three-quarters of a century.

The Association of Oldest Inhabitants of the District of Columbia has interested itself in preserving a section of the trunk of this famous tree, and when the work of demolition is under way proper steps are to be taken with this end in view.

Telegraph and Telephone Life Insurance Association

Assessments 681 and 682 have been levied by the Association to cover the claims arising from the deaths of John J. Lane, Hamilton F. Strong, Sidney B. Gifford, Absolom D. Hale and Hugh McMillan.

Single Line Repeater

The single line telegraph repeater manufactured by the Jester-Cooper Company, Houston, Tex., is being used successfully on several large railroad systems and in commercial telegraph service.

The management of this repeater is as simple as that of an ordinary single relay and sounder set, with which all telegraph operators are familiar. No local battery is required in its operation.

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SUBMARINE CABLES

Offley Crew-Bead, of the Commercial Pacific Cable Company, Shanghai, China, left New York some days ago for Shanghai, after visiting friends in this city and England, where he left a daughter to be educated. Mrs. Crew-Bead remained in Pasadena, Cal., while her husband came East.

Col. A. B. Chandler, late president of the Postal Telegraph-Cable Company, now retired, celebrated his eightieth birthday at Randolph, Vt., on August 20. Citizens of Randolph, headed by the postmaster, prepared an elaborate signed testimonial, which, together with valuable presents in the form of cut glass and floral tributes, was presented to Colonel Chandler at his summer home—Mari-Castle, Randolph.

S. E. Powell has been appointed general plant manager, Western Union cable system, New York.

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All-America Cables

Captain Taylor, of the cable ship *Guardian*, sailed from New York on the S. S. *Imperator* on September 9, for England. He will spend several months abroad in connection with the building of a new cable ship the company has contracted for.

J. B. Smith, superintendent of the Valparaiso, Chile, station, accompanied by Mrs. Smith, passed through New York recently on a trip to London, England. Mr. Smith is on furlough.

A. S. Baker, manager at Lima, Peru, spent a few days in New York recently while on his way to Plymouth, England. He will return to South America about the first of next year.

F. W. Phelan, general commercial superintendent, has returned from a three weeks' trip through New York State, Massachusetts and Vermont. He reports having had a very enjoyable vacation.

B. H. Reynolds, superintendent, has returned from a trip to San Francisco, Cal.

Alfred Clark, of Barranco, Peru, after twenty years' service on the coast, accompanied by his wife and family, passed through New York recently on the way to Bermuda, where he will spend his vacation.

Jordan Herbert Stabler, vice-president, has returned to his office after a short vacation spent at York Harbor, Me.

Manager Ruzo, of the Callao station, spent several days in New York recently prior to taking steamer for France, where he will spend his vacation.

Manager McConney, of Iquique, Chile, accompanied by his family, was in New York a few days recently before sailing for Barbados, B. W. I., where vacation time will be spent.

Beautiful Models of the All-America cable ships *Relay* and *Guardian* have been placed on exhibition in the company's new building at 89 Broad Street. Customers and other visitors to the building have been much interested in the display.

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North Sydney, N. S., Western Union Cable Station

W. T. White, superintendent at North Sydney, Nova Scotia, of the Western Union cable station, is away on a two months' vacation—the first relief he has had in several years. He is visiting friends at St. John, Bay Roberts and Hearts Content, Newfoundland. D. H. Cameron, assistant superintendent, is acting superintendent in Mr. White's absence.

Dr. Doty, director of physical welfare, New York, was an official visitor at the cable station at North Sydney, N. S., recently.

W. Thompson, station electrician, Western Union cable station, North Sydney, N. S., has gone to St. Pierre, Miquelon Island, on company business.

The "Relay" Race in the swimming races held at North Sydney, N. S., on August 18, was won by the cable office team, the prize being an oak and silver shield, with accompanying medals. The four winners were: W. H. Taylor, C. E. Burke, G. C. Hinshelwood and W. Richards. Three other teams competed; one from North Sydney, one from Sydney Mines and one from Sydney. The one-mile race was won by C. E. Burke, and the high dive by W. H. Taylor. The entire station staff—the "cable boys," feel proud of the team's showing.

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Mexican Telegraph Company Buys Additional Real Estate in New York

The Mexican Telegraph Company, which owns and occupies the two four-story buildings at 85 to 89 Broad Street, comprising the block front on the east side of Broad Street, between Stone and South William Streets, has purchased from the Eno estate and Columbia University, the abutting four and five story buildings at 27 and 29 Stone Street and 39 and 41 South William Street. The property has a frontage of 46.8 feet on Stone Street and 38 feet on South William. With this acquisition the Mexican Telegraph Company controls a frontage of 70.1 feet on Broad Street, 94.3 feet on Stone and 70.9 feet on South William Streets.

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Radio Telegraphy

Radio Corporation of America Notes

EDWARD J. NALLY, president, returned from Europe on the S. S. *Imperator,* on September 5.

F. A. STEVENSON, of the American Telephone and Telegraph Company, has been elected a director of the Radio Corporation of America.

A NEW BRANCH OFFICE has been opened at 500 Fifth Avenue, New York. A. Y. Aymong is manager.

J. A. POHL, superintendent at New Orleans, is in New York on a business trip.

W. A. WINTERBOTTOM, traffic manager, was a recent visitor at the naval radio station at Bar Harbor, Me.

THOMAS J. HAYDEN, engineer in charge, of the Tuckerton, N. J., station, has been transferred to the New Brunswick, N. J., station.

HOWARD J. SMITH, has been appointed engineer in charge of the Tuckerton, N. J., station.

J. WILMER ASHMORE has been appointed junior receiving engineer at the Lakewood, N. J., station.

THE STATION at Chatham, Mass., on August 1, took over the operation of the United States-Germany radio circuit, working with Nauen (POZ).

IN THE NEW YORK OFFICE, R. Blanqui has been appointed junior operator. Other recent appointments include G. C. Otten, H. Fulton, R. F. Brown and T. Millea; Messrs. Otten and Brown being transferred from other stations.

W. R. GOMPF, late from the Pacific Coast, has been appointed supervisor at the Lakewood, N. J., station.

STEWART REYNOLDS has been appointed chief clerk to General Superintendent E. B. Pillsbury, New York. Mr. Reynolds was for several years a member of the treasurer's staff, Postal Telegraph-Cable Company.

GEORGE MCEWAN is acting as manager of the New York station (WNY), vice J. W. Swanson, absent due to illness.

ROY C. CROSBY has been appointed operator at WNY station, New York.

WALTER HOWELL is technical instructor at the Marconi Institute, New York.

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LIEUTENANT DONALD PIERI, of the Signal Corps, who during the war period was an instructor in radio at Army schools, is now on the Mexican border in charge of radio installation.

J. HOLTAPPEL, in charge of radio work in the Dutch Navy during the war, has been appointed acting engineer of government telegraphs in Java, with headquarters at Batavia.

COLONEL EDGAR RUSSEL, Signal Corps, United States Army, and who was a Brigadier-General in charge of the Signal Corps operations of the American Expeditionary Forces in France during the late war, is now stationed in New York as Signal Corps officer of the Department of the East.

JOHN FREDERICK CHAMBERS, in the British naval transport service during the late war, has been appointed Superintendent of Radio Service for the Cunard Steamship Company.

CHARLES A. CULVER, during the late war a major in the Signal Corps, United States Army, attached to the staff of the Chief Signal Officer, has returned to his duties at Beloit College, Beloit, Wis., where he is professor of physics.

MAJOR S. T. DOCKRAY, in aerial radio service with the British Grand Fleet during the late war, has been appointed supervising construction engineer to the Ministry of Communications, China.

G. M. KAMANTIGUE, of the Bureau of Posts, Manila, P. I., is in the United States, where he will remain for an extended period, investigating radio telegraph and telephone systems for his government.

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Your Money's Worth

One would have a hard job finding anything of use which today sells for the same price it sold for before the war. Everything that goes into manufacture and production of any sort has increased in cost 100 per cent. or more. TELEGRAPH AND TELEPHONE AGE, however, is not only still selling at pre-war figures (two dollars per year), but it is a more useful journal today than ever before. If the reader is not a regular subscriber he should lose no time in sending in his name while the present low subscription rate remains in force.

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FRANCIS BENNER, aged 77 years, who was district superintendent of the United States Military Telegraph Service at the end of the Civil War, died at his home in Pittsburgh, Pa., on August 17. Mr. Benner is survived by four daughters and three sons.

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COURTESY AND JULIA

By GEORGE S. WALTERS

Western Union Telegraph Co., Wheeling, W. Va.

Reams have been written on the subject of courtesy. Bulletin 37 covers the subject thoroughly, but, sad to relate, very little attention is paid to it in some offices. Fortunately these are few in number. How any manager or any employee can fail to appreciate the potency of all that it implies is a mystery. Take the counter clerk first: While good looks and personality are assets of pronounced value to the counter clerk, experience has shown that these attributes are not essential to her success. Kipling's "A rag, a bone and a hank of hair" is a literal description of the best counter clerk I ever knew. She had lustreless, straw-colored hair, green eyes, a long melancholy face, freckles, and a form cast in acute angles, but—here my poor powers of description fail me. But, she had so many splendid traits of character; such a winning smile; such tact and intelligence; such an uncanny knack of reading character; such real diplomacy in handling the temperamental; such astonishing powers of anticipating another's wants; such sympathetic consideration for the troubled and such sincere eagerness in sharing their burdens, that her lustreless hair and her green eyes were immediately forgotten and she was remembered only for her intellectual charm and bigness of heart. She positively radiated it. The crabbed, the grouch, and the irritated fell an easy prey to her hypnotism.

She increased the counter file right from the start. Everybody wanted Julia. Customers demanded her attention. She could handle several customers apparently simultaneously as smoothly as one—and all with equal ease.

Once I asked her if she were always the same: If her sunny smile, her charm of courtesy were natural, or assumed. "They were assumed at first," she replied; "but now it seems perfectly natural. I am not always thus, often I lie awake and cry through the long hours of the night. The happiness that awaits most women, I realize, is not for me, but what's the use? We live only once; why not get all the pleasure out of our brief span of life that we can? If your heart aches, who cares? Hide it. If you have neuralgia, keep it to yourself. Thousands of people are blind, legless, armless, toothless, hungry. What's a little heartache or neuralgia compared with these? Scatter the flowers; that's my viewpoint. Help someone; that's my creed. It's a good creed from every point of view —the best I know. Why scowl? Why swear? Why loose your temper and hurt your digestion? It hurts others and hurts you. You know, sometimes I believe that a gentle word is attuned to the infinite. It passes out into the vibrations of the universe and becomes a part of the things that are or should be. I haven't very much, but what little I have I purpose to divide with others. I can't lose anything and I might win. See? I'm selfish."

The first day Julia was employed she came to me and said: "I want to know all there is to know about this business. How can I learn it the quickest way?" We had no simple bulletins in those days—only a tariff book which was sufficiently elastic to mean several things. I advised her to study the tariffs and rules and to "Stop, look and listen" —do the right thing at the right time in the right way. Try and be a human magnet that will draw the public to you.

Julia devoted all her spare time to tariffs and rules, and in an incredibly short time knew more than many of the older employees. They began to go to her for advice. Not content with knowing the counter work, she delved into the bookkeeping department, the delivery and telephone. "I might have to do this some day," she would say, and I want to be prepared. She established little plans for short-cutting, not only in her own department, but in others.

She made up what she called her Bureau of Information, consisting of time tables, trolley routes, hotels and rates, public officials, various lines of trade, fraternal organizations, theatres, etc. This was elaborated from time to time until it included all the neighboring towns and suburban points. It became a very important adjunct to our office—a sort of "Ask Foster" bureau that brought us business in more ways than one. People began to say: "Ask the Western Union, they can tell you." For instance, a traveler comes to our counter and writes a telegram: "How can I get to the town of Preston in the quickest way?" he asks. "Take the Berryville trolley at corner of Lynn and Chestnut Streets, this side; leaves every half-hour; takes forty minutes. If you intend to spend the night there the Globe Hotel is a very good one"; or, "How long will it take to send a telegram to Louisville and get a reply?" "Louisville, Ky., forty cents fast telegram. Day letter sixty cents, fifty words. We have direct wire to Louisville. Conditions normal. Ought to get through in eighteen minutes. If answered immediately you should have a reply in—let me see—by, say, 10:40."

Another inquiry: "What's going on in town to-night?" "First class drama at the Palace Theatre. 'The Mummy and the Humming Bird.' I haven't seen the show, but am told it's very good. Good vaudeville bill at the Olympic, next block above; popular prices. The 'Band Box' is exceptionally good; saw it last night. Five or six good movies around the corner on Pine Street."

Julia was a business builder. Nothing that would pull a message escaped her. She contended that twenty per cent. of the messages filed at the counter, exclusive of those asking for answers, contained the germ of other messages which by diplomatic suggestion could be developed. She proved it by developing them. As time went on there was nothing that girl could not do in the office. She made herself indispensable. Alas! She went the way of most good girls. She got married, and my best wish is, that she is as happy as the countless others she made happy by a philosophy which holds as good today as it did in the beginning of time.

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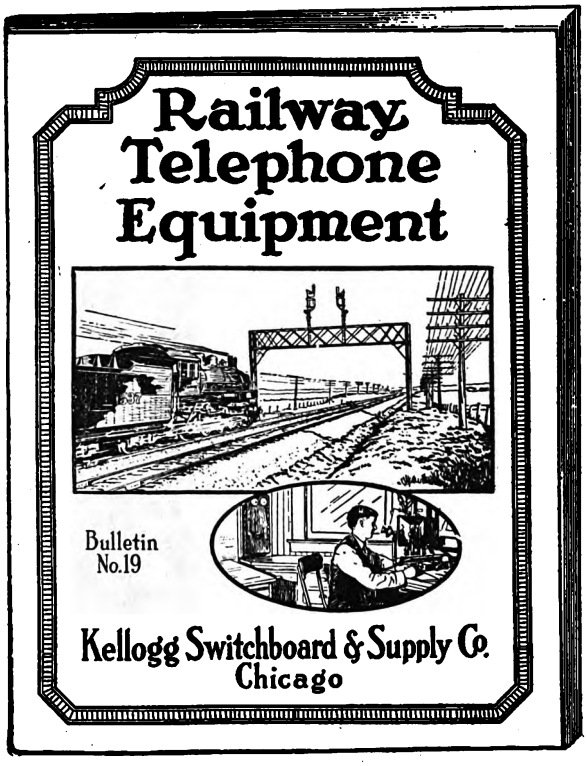
Did You Get Your Copy?



This bulletin gives description of Kellogg

Simplex Coils
Composite Coils
Condensers
Cords
Test Sets
Despatching Equipment and Telephones for Railway and General Purposes.

Since the last meeting of the Telegraph and Telephone Division, we have issued this catalogue, now ready for distribution with a net price list covering its contents.

Our Railway Sales Representative, Mr. John Sidlo, will attend the convention and make his headquarters at the Fort Garry Hotel where he will be glad to talk over telephone equipment of our manufacture that you may be interested in.

Kellogg Switchboard & Supply Company

Adams and Aberdeen Streets

Chicago, Ills.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

Charles C. Adams Becomes Bank President

Charles C. Adams, who retired from the vice-presidency of the Postal Telegraph-Cable Company about one year ago, has been elected president of the Peninsula National Bank of Cedarhurst, Long Island. The bank's business covers all important financial transactions of the Rockaway Peninsula, and directly the communities of Lawrence, Woodmere, Hewlett and Inwood. The bank is affiliated with two of the strongest financial institutions of New York City. Mr. Adams also is president of the village of Lawrence.

H. F. DART, assistant principal of electrical engineering, International Correspondence Schools, Scranton, Pa., was a New York business visitor recently. Mr. Dart is a graduate of Purdue University, and is preparing a complete course in radio telegraphy for the Scranton schools.

F. H. DOANE, principal of the school of electrical engineering, International Correspondence Schools, Scranton, Pa., was a New York visitor on August 16.

G. M. DODGE, of Valparaiso, Ind., accompanied by his wife and daughter, were in New York, September 10th, while en route home from the New England States. Mr. Dodge made the trip from Valparaiso in his touring car, and spent one month in covering the States from Indiana to Maine.

WILLIAM E. HARKNESS, for many years telephone engineer in the service of the Western Electric Company, and the Hall Switch and Signal Company, is now general manager of production for the Powers Accounting Machine Company, New York.

J. B. DILLON, wire chief, Western Union Telegraph Co., Denver, Colo., is spending his vacation taking a trip through Yellowstone National Park.

THOMAS AHEARN, president of the Ottawa, Canada, Light, Heat and Power Company, and president of and director in several other large electrical enterprises, was a New York business visitor on September 1. When he was a young man Mr. Ahearn was one of the star telegraphers of the Dominion.

POSTAL TELEGRAPH-CABLE COMPANY

RECENT VISITORS to the executive offices included H. D. Reynolds, superintendent, Buffalo, N. Y.; G. W. Ribble, general Superintendent, Atlanta, Ga.; K. F. Stiles, superintendent, Charlotte, N. C., and G. A. Phillips, manager, Lynchburg, Va.

JOHN J. WHALEN, traffic manager, although away on his annual vacation, keeps his mind on the lines—not the kind of lines that carry telegrams, but the kind that have fish-hooks on one end.

WORD WAS RECEIVED in New York on September 3 to the effect that Mrs. Edgecomb, wife of A. L. Edgecomb, formerly superintendent at Boston, Mass., for the Postal Telegraph-Cable Company, had died at Boulder, Colo. Mr. Edgecomb went to Colorado several years ago to benefit his health, and the death of his wife leaves him alone, as they had no children.

MANAGERS APPOINTED: I. A. Michael, Mishawaka, Ind.; S. Frandle, Lexington, Neb.; A. W. Hamilton, Lafayette, Ind.; D. F. Shaffer, New Castle, Ind.; R. E. Smith, Evansville, Ind.; J. E Drake, Hampton, Va.; C. H. Waggoner, Lexington, Ky.; M. B. Howorth, Orange, Tex.; R. B. Buckley, Newport, Tenn.; F. C. Boteforth, Pittsburg, Kan.; I. L. Neel, Abilene, Kan.: H. Dunlop, Eaton, O.; F. A. Putnam, Omaha, Neb., and S. G. Kitchen, Sacramento, Cal.

CHARLES E. STUMP, manager of the 105 Dock St. office, Philadelphia, Pa., has returned from a two weeks' vacation.

New York City Postal

THE FOLLOWING CHIEF OPERATORS employed in the main operating room have returned from their vacations: P. L. Reily, Vincent Fiore, J. A. McNulty, M. F. Callahan, W. J. White, and C. P. McInerney.

C. DI SILVESTRO, operator at the 1775 Broadway office, has been appointed manager at 1906 Broadway.

P. REBECCA, manager at 75 Madison Avenue, has been transferred to 26 Cedar Street office as manager.

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Albany, N. Y., Postal

W. M. PRUYN, manager, Albany, spent his two weeks' vacation at points in the Thousand Islands.

W. A. CRAWFORD, all-night chief operator, has returned from his annual vacation.

N. C. PANGBURN, district foreman, is spending his vacation with his parents, who live near Binghamton, N. Y.

W. J. HAMILTON, from Utica, N. Y., has been appointed operator of the Albany-New York bonus wire.

A. T. POST, manager at Newburgh, N. Y., has been away from duty for a short time on account of illness.

Pittsburgh, Pa., Postal

UPON THE RETIREMENT of E. E. Heasley, from the position of chief operator of the Pittsburgh main office, to accept the position of general wire chief, the employees of the operating department presented him with a silver loving cup suitably engraved.

DOROTHY BIDDLESTONE has been appointed manager at McKeesport, Pa., vice F. Dayton, who will act as relief operator.

ROBERT C. IRWIN is relieving Miss F. A. Sullebarger as manager at Huntington, Pa., while the latter is on vacation.

RALPH F. DES GRANGES has been appointed operator at Wheeling, W. Va.

CLIFFORD CONNER, wire chief at Pittsburgh, has returned from his annual vacation.

GEORGE W. DULL, general quad chief, Pittsburgh, has returned from his vacation.

ANTHONY J. HOELZLE, for some time past repeater chief in the Pittsburgh office, has resigned to engage in the electrical business in Columbus, Ohio.

Buffalo, N. Y., Postal

H. H. ABBEY, after seventeen years at western offices, has returned to the Buffalo office, where he was formerly wire chief.

GEORGE H. HENNINGHAM of the Market Street office is on his annual vacation.

F. J. MALONEY, assistant to Manager A. M. More of the Chamber of Commerce office, spent his vacation at Dunkirk, N. Y.

G. W. MALONEY, all-night chief, Buffalo, spent his vacation at Dunkirk.

Boston, Mass., Postal

A DIRECT WIRE has been installed between the Boston and the Philadelphia wool districts for the purpose of expediting telegraph traffic between these important commercial centers.

BRANCH OFFICE MANAGERS Kellen, of City Hall Avenue office; Tobin, of Devonshire Street, and Donovan, of Essex Street office, have returned from their vacations, which were spent in the White Mountains.

WILLIAM E. KETTLES, who died recently, as announced elsewhere in this issue of TELEGRAPH AND TELEPHONE AGE, for several years was employed in this office.

Chicago, Ills., Postal

R. T. BAKER, chief operator at Detroit, Mich., has been promoted to the managership of that office.

C. F. CRITTENDEN, who has been in the service at Detroit, Mich., for some time, has resigned on account of ill health. He has returned to his home at Topeka, Kan., where he was formerly in the Postal Company's service.

F. S. EATON, heretofore traffic chief at Detroit, Mich., has been advanced to the position of chief operator.

M. E. BOURKE, formerly in the service at Peoria, Ill., and Galesburg, Ill., is temporarily relieving the manager at Port Huron, Mich.

MISS M. COHN, daughter of Manager Cohn, of Pekin, Ill., has been appointed manager of the office at Granite City, Ill.

Death of William E. Kettles

William E. Kettles, aged 72 years, the telegrapher who received the telegram in the War Department, Washington, on April 3, 1865, announcing the fall of Richmond, died at Charlestown, Mass., on August 28.

At the time the famous telegram was received Kettles was but seventeen years of age, and although the fall of the Confederate Capital had been anticipated for several days, the message, "We entered Richmond at eight o'clock this morning," signed General Weitzel, caused the greatest rejoicing through the Northern States.

Mr. Kettles, after the war, became one of the most expert Morse telegraphers in the country, as the records he made at various telegraph tournaments attest.

The funeral was held on Wednesday, September 1, and was attended by a large number of Mr. Kettles' former telegraph associates, and other friends. Among those who attended the funeral were J. D. McDonald, manager of the Boston office, Postal Telegraph-Cable Company; Daniel Carter, assistant chief operator, Western Union Telegraph Company, and F. T. Viles, secretary of the Harvard Building Association, Boston.

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WESTERN UNION TELEGRAPH CO.

C. M. Brentlinger, general traffic inspector, traffic department, is in New York for a week or ten days, after which he will return to the cable station at Miami, Fla.

Emmet E. Baker has been appointed chief operator at Akron, Ohio, effective September 1, vice E. M. Srodes, transferred.

G. W. Carey, assistant manager of the Havana, Cuba, office, started on the return trip to Havana on September 11, having been in New York several weeks.

News Items from the executive offices are scarce this week because quite a number of the officials and their assistants, returned from vacations, are engaged in the dual occupation of catching up with what has transpired while they were away and of nursing sunburned faces.

Council E. King, heretofore manager at Greensboro, N. C., has been transferred to Richmond, Va., as a member of Superintendent W. G. Sale's staff. He is succeeded as manager at Greensboro by H. N. Preddy, chief operator.

The Company has completed the installation of new and up-to-date office and operating equipment at Worcester, Mass. The office is located at No. 19 Mechanic Street; the business office on the ground floor and the operating department on the second floor.

William F. Murray, of the equipment staff, Buffalo, N. Y., has been transferred to the Syracuse, N. Y., district, where he will be ticker inspector in the plant department.

J. E. Armstrong, of General Manager T. W. Carroll's office, has resigned from the service to enter another line of business.

Miss M. L. Ingles, of the general manager's office, southern division, Atlanta, Ga., was a recent executive office visitor.

H. F. Taff, general superintendent, Washington, D. C., is spending his vacation at Atlantic City, N. J.

C. G. Carpenter has been appointed manager at Syracuse, N. Y.

Metropolitan Division, Western Union

H. Bolshaw has been appointed acting manager of the credits and collections bureau, 395 Broadway, vice J. Tausek, resigned.

James Lister has been appointed division cable manager, with offices at 395 Broadway, New York, vice Albert Lister, resigned.

J. R. Hyland, district commercial superintendent, first district, announces the following appointments as managers: J. J. Driscoll, Fulton Market branch; Miss M. Schneider, New York Life Insurance Building; P. A. Ingelzi, 238 Greenwich St.; H. B. Martin, Jr., 171 Franklin St.; P. E. Grogan, 255 Church St.; G. Hohenstein, 306 Broadway.

John T. Carberry has been transferred to the office of the district commercial superintendent, first district.

Fourth District Employees now on vacation include: C. A. Harvey, W. H. Sembler, Mrs. S. Smith, B. I. Woods, J. O. Klein, J. Keevin, Miss M. Gregory, A. D. Shaw, J. Burke and W. Hines.

John Driscoll, aided by twelve operators, is at Forrest Hills, L. I., moving the large increase of telegraphic traffic due to the National Tennis Championship games now being held there.

Five Hundred messenger boys attended the outing held recently at Munger's Beach. The affair was under the management of R. F. Murphy, supervisor of sports for the Metropolitan Division. The second district boys carried away the team honors and the fourth district athletes excelled in the swimming events.

Western Union—Gulf Division

J. C. Jackson, formerly office manager at New Orleans, has been appointed city superintendent at Dallas, Texas, to succeed L. A. Ott, resigned. Mr. Ott will engage in the brokerage business.

J. M. Delmar, district commercial manager, Little Rock, Ark., is motoring through the Atlantic States on his vacation.

J. E. Andrews, teller at the Citizens National Bank, Pawhuska, Okla., has resigned his position to accept a place in the Western Union office at Pawhuska. He says there is a greater future with the Western Union than with banking.

L. Laff, of New York, supervisor of tailors and uniforms for the entire system, made an inspection trip through the Gulf Division recently.

J. F. Wilson, district commercial superintendent of the third district, is the happiest man in Texas—his wife, two children and Mrs. S. G. Wilson, his mother, having moved here from Memphis, Tenn, Mr. Wilson has just completed an inspection tour of Louisiana.

Miss Myrtle Kyser, stenographer to the general manager's staff, was married August 21 to A. A. Sneed. Mrs. Sneed continues in her telegraph position to the complete satisfaction of all concerned.

J. W. Wooters, district commercial manager, Houston, Tex., has been appointed manager at Abilene, Tex.

W. H. Schroeder, of General Manager Mohr's staff, is enjoying a well-earned vacation.

Miss Maude Spinks, bonding clerk in Superintendent Wilson's office, has accepted a position with the M. & O. R. R. at Meridian, Miss.

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R. C. Baker, general manager of the American District Telegraph Company, was a visitor at the general offices recently.

ELMER E. LOUDERBACK, district commercial manager, at Oklahoma City, is spending his vacation in the Osage Indian lands, completing his study of the saxophone.

MRS. MITTIE VAUGHN, wife of W. M. Vaughn, in charge of fiscal agency matters in the general office, died suddenly August 26.

MANAGERIAL APPOINTMENTS have been announced as follows: J. E. Hall, Longview, Texas; Otis May, Pharr, Texas; L. F. Hornbeck, Monroe, La.; E. E. Jernigan, Port Arthur, Texas; J. B. Piland, Stuttgart, Ark.; L. A. Goldboro, Blytheville, Ark.; J. B. Tault, Van Buren, Ark.

Signal Corps Men in Camp

Company A of the First Battalion Signal Corps, National Guard, N. Y., returned from a camp of instruction which was held at Camp Upton, N. Y., from August 15 to 29. This is the unit that won prominent mention for its methods in "putting it over" in France. It is officered by Captain Lawrence J. Gorman, of the Engineering Staff of the New York Edison Company; First Lieutenant W. B. Schreiber, manager Postal Telegraph-Cable Company, and First Lieutenant Harold W. Kloth of the engineering staff of the Western Electric Company.

At the camp of instruction the routine duties of signal troops was gone into thoroughly; special training being given by instructors of radio telegraphy in that branch of signal work, and many commercial operators who had the opportunity of attending the camp returned with knowledge of a branch of telegraphy to which they paid little or no attention before joining the National Guard. On the roster of the unit the following names appear, which speak well for the organization: W. G. Hunt, manager, Western Union Telegraph Co., Church Street branch; Henry Medollo, operator, Postal Telegraph-Cable Co., Cotton Exchange; Alfred Martini, operator, Postal main office; R. M. Holmes, operator, Postal, 20 Broad Street; J. F. Whalen, operator, Stock Quotation Telegraph Co., and J. M. Charleberg, operator, Postal main office, New York.

THE OLD WIRE CHIEF SAYS: "The other evening I was about to give my eighteen-year-old son a tongue lashing for not being more ambitious—devoting more time to study; when, suddenly, I recollected that when I was his age my prospects in life, so far as I could see, hinged upon my retaining my place as bass singer on the Gladstone Quartette."

Telegraph Items from the Philippine Islands

MESSRS. HOWARD AND VILLANUEVA, radio engineers of the Bureau of Posts and Telegraphs, have completed the construction of a 5-k.w. radio station at Cebu, Cebu, Visayan Islands. The engineers are engaged in establishing an inter-island radio service. A 5-k.w. station was recently completed at Iloilo, and a 20-k.w. station is to be constructed at Batangas, Luzon Island.

CONSTANCIO ALIMON was an official visitor at Cebu recently. Operating with the cableship *Bustamante,* he is engaged in repairing submarine cable interruptions between Cebu-Masbate, Tabaco-Virac and Pasacao-Guinayangan.

PEDRO REVECHO, of the Morse department at Dumaguete office, has been appointed postmaster at Surigao, P. I., vice Ramon G. Reyes, appointed assistant postoffice inspector.

JOSE TOPACIO, director of posts, and EUGENIO PADUA, superintendent of the telegraph division of the Bureau, are taking a keen interest in the development of the telegraph staff. All members of the organization are being encouraged to take up the study of the technical and traffic details of the business.

ELIAS T. CRUZ, of the Bureau of Posts and Telegraphs, Manila, P. I., is now in New York, where he is to remain until about the end of the year, familiarizing himself with American methods of handling telegraph traffic.

THE TELEGRAPH TOURNAMENT, discussed in recent issues of TELEGRAPH AND TELEPHONE AGE, has stirred up considerable enthusiasm among Philipino native telegraphers. We believe the American telegraphers who, during the days of American occupation, taught us how to speed up with the Morse key, would be surprised to learn that in the Islands there are many first-class senders. T. E. Bower (Dad), no doubt would be glad to know that his hard work has not been in vain. A few of the expert telegraphers whom we would like to see pitted against the best men in the States are: Fernando Fe Benito, ex-chief operator of Cebu office; Canuto Gerardo, assistant chief operator, Manila; Exequiel Abella, chief operator at Masbate; Jose Alivio, chief operator at Iloilo; Juan Aquino, chief operator at Cebu; Eustaquio Dino, assistant chief operator at Cebu; C. Pasvisky, Simon Simbolan, Amando Arriola, Mariano Juniongko, Ramon Pascual, Narciso Larraquel, Constancio Navarro, and several others who have made fast time in sending by wire. Philippine telegraphers hope the tournament is to be held and that it will be possible for them to have contestants at the tables in all events.

S. REYES, of the Bureau of Posts and Telegraphs, Philippine Government, Manila, P. I., is in New York, where he will remain several months familiarizing himself with American telegraph systems, for the purpose of introducing improvements in the Philippines.

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Telegraph and Telephone Age

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The Semi-Bridge System of Duplexing Submarine Telegraph Cables (Kajiura's System).

By the Late J. KAJIURA, Revised by S. SUZUKI

INTRODUCTION

Since Dr. Alexander Muirhead devised his system of duplex working for submarine cables it has been widely adopted as a standard method of operation. It is well known that in the Muirhead system such a number of cable boxes as represent the whole, or nearly the whole, length of the actual cable must be provided to obtain a perfect working balance.

Cable engineers early sensed the desirability of devising a means whereby the number of artificial line units might be reduced, provided a practicable scheme was developed, and one with which a perfect balance could still be obtained. The question is one mainly of economical use or terminal apparatus.

Mr. Jiuzo Kajiura, late chief engineer of telegraphs and cables, Tokyo, Japan, for some time carried on an exhaustive research with the object of devising a system by means of which submarine cable lines might be operated satisfactorily with a reduction of the customary number of artificial line units. The result of this work was that a system was perfected wherein an artificial line consists of constants the equivalent of but one-half that of the actual cable. The inventions have been covered by patents granted in the United States, Great Britain, France, Japan and Germany, under the name of "The Semi-Bridge Duplex System."

In Japan excellent results are being obtained by the application of the Kajiura method to a number of submarine telegraph cables.

The following description of the system has been prepared at the invitation of the editor of TELEGRAPH AND TELEPHONE AGE, with the thought that the information may prove interesting to cable engineers in the United States and elsewhere.

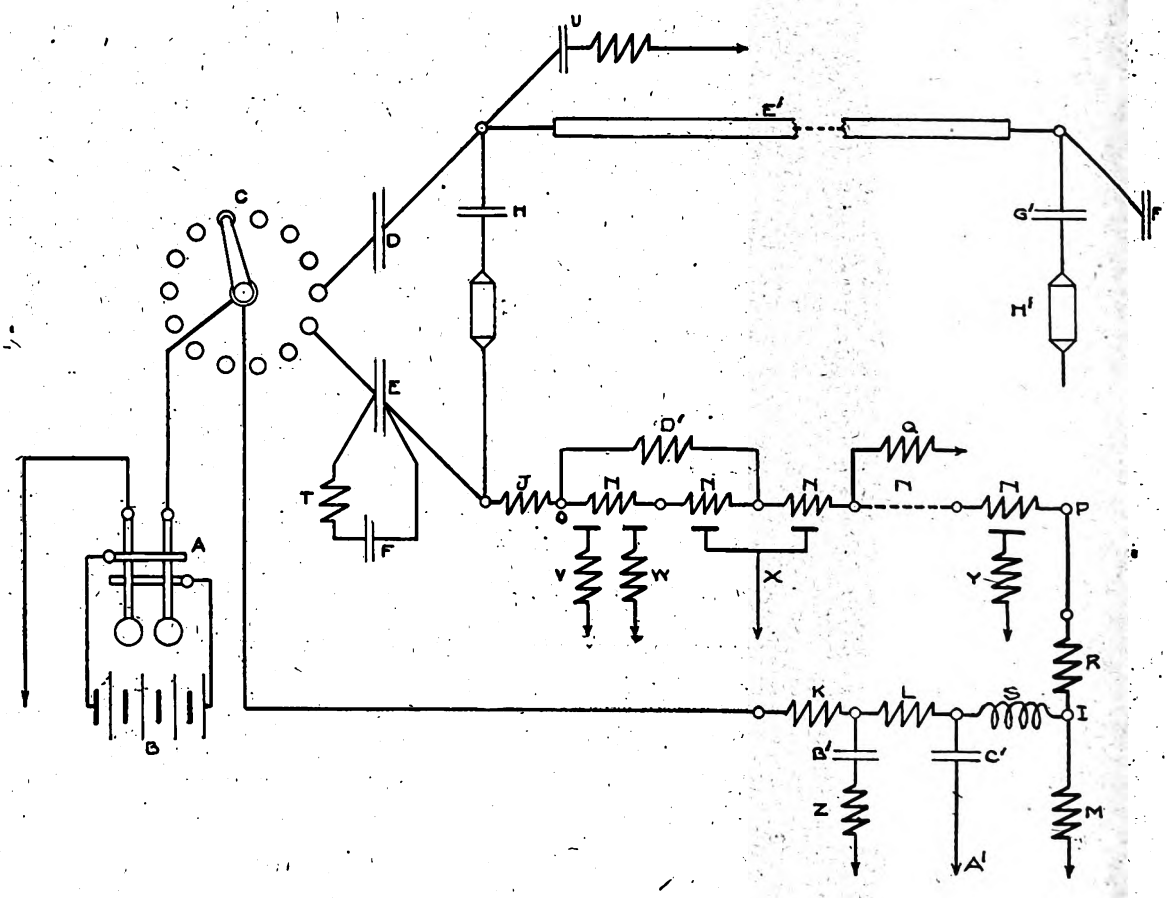

FIG. 1

PRINCIPLE OF THE SEMI-BRIDGE DUPLEX

The "Semi-Bridge Duplex" is illustrated dia-

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grammatically in Fig. 1, in which the duplex arrangement at the distant end of the cable circuit is much abbreviated for the sake of simplicity.

When a sending battery is applied to one of the block condensers, which are interposed at both ends of the line cable, the cable throughout the whole

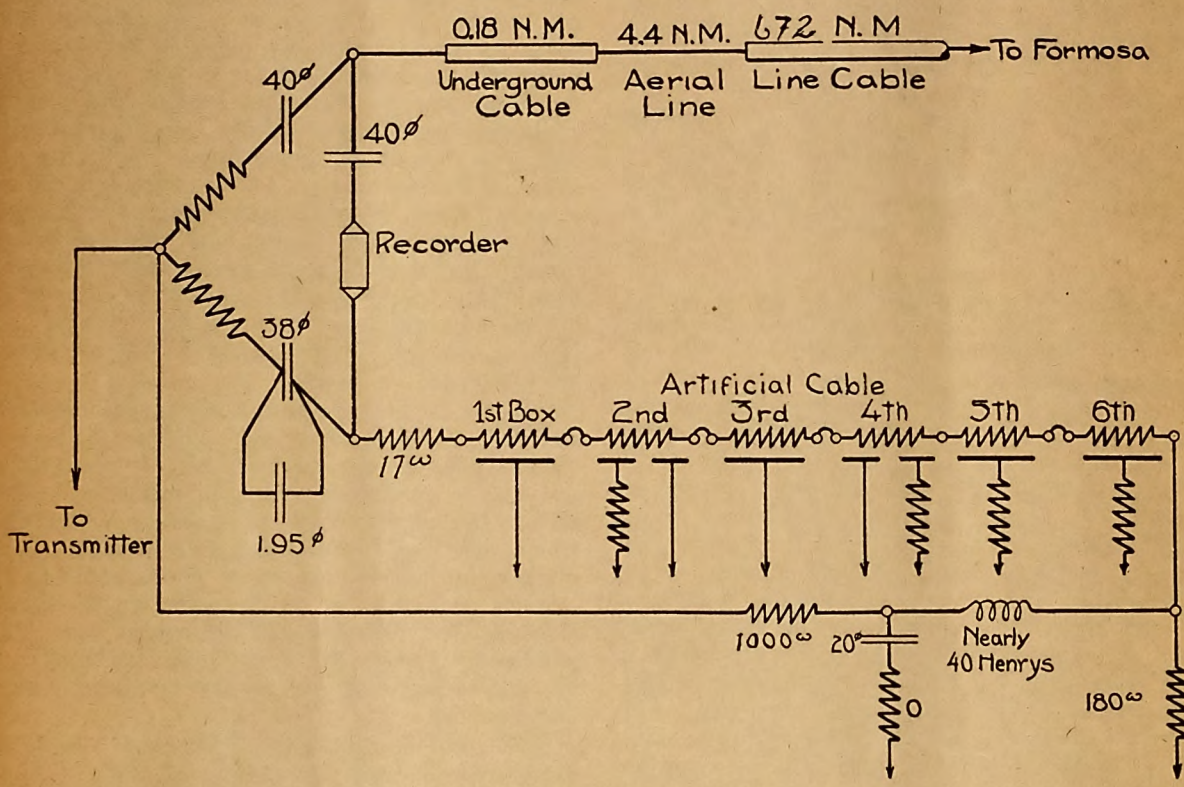

Fig. 2

length will ultimately attain a certain potential which is determined by the voltage used, the capacity of the cable itself, and of the block condensers; this potential is hereinafter called "the ultimate potential."

The ultimate potential is by no means established at once; on the contrary, not only is there always a lapse of time before a cable attains the ultimate potential, but the relation of time and the rise or fall of potential is different according to the positions of the cable. At the two ends of a cable circuit a certain time passes before the ultimate potential is attained, while there is always a certain intermediate position where the required duration of time is much shorter, and the relation of time and the rise or fall of potential can easily be imitated by a suitable simple means without resorting to artificial cables.

This intermediate position, which is hereinafter called "the intermediate position," is generally at or near the center of the cable circuit.

It will thus be seen that, if only such artificial cables as correspond to that portion of the line cable lying between one end and "the intermediate position" be used, and a suitable means, which can imitate the relation of time and the rise or fall of potential at the intermediate position of the cable, be provided at the end of the arificial cables, an exact duplex balance can be obtained, there being no need for using so much artificial cable as to correspond to the whole, or nearly the whole, length of the line cable, such as is used in ordinary duplex systems.

This invention is based on the principle explained above. In the accompanying diagram (Fig. 1) the artificial cables N from O to P correspond to that portion of the line cable lying between its left end and the intermediate position, and the resistances of the parts of the circuit KLSM, branching from the center of the balancing rheostat C, are so adjusted that the potential of I is equal to the ultimate potential of the line cable, and in order to make the relation of time and the rise or fall of potential of I, so connected to the artificial cable, equal to that of the intermediate position of the line cable, an adjustable self-inductance S and capacities B′ and C′, with or without retardation resistances, are introduced into the circuit, and in some cases a simple resistance, or a resistance having more or less self-inductance, is inserted between P and I.

In the accompanying diagram, Fig. 1, are shown two capacities, B′, C′, and two resistances, K, L; but generally one capacity and one resistance suffices

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for the purpose explained, although there are some cases where it is found better or convenient to use capacities and resistances that are more subdivided, or to use artificial cables instead of capacities and resistances.

In the diagram the principal parts only are shown, and it is understood that in some cases other resistances, capacities and self-inductances, which are not shown in the diagram, may be added according to the nature of the cable circuit.

Those parts which are not specially explained above, such as shunt or retardation resistances of artificial cables, etc., have the same function as in the ordinary duplex systems, and they are to be modified so as to suit the nature of the cable circuit.

I should like to call attention to the self-inductance, the use of which as an accessory in the imitating circuit characterizes the system. If the self-inductance with iron core is used there will be produced some slight jerk on sending quick reversal currents from the home station. The jerk is due to the residual magnetism of the iron core, which varies the self-inductance at the instant of current reversal. This phenomenon can be removed by the use of a smaller inductance; yet, as it is then necessary to make the resistance and capacity in the supplementary circuit correspondingly smaller at the same time, the amplitude of the signal waves at the receiving station may be found too small, so it becomes necessary to have the sending voltage increased to enhance the amplitude. But with ironless inductance, on the contrary, this slight want of balance will not be apparent, and a perfect balance can be obtained.

With the increase of cable length, the inductance and its subjoined condenser must be increased and the resistance M decreased, generally.

When proper adjustments are made on different parts of the semi-bridge duplex, the relation of time and the rise or fall of potential caused by the sending battery at the home station will be exactly similar in both the cable, lying between its end and the intermediate position, and the artificial cable; so there cannot exist any potential difference between the two sides of the receiving instrument of the home station when that station sends signals, while the instrument faithfully responds to the signals sent from the distant station. With the ordinary duplex system it is sometimes found difficult, or very tedious, to get an exact duplex balance, but with the semi-bridge duplex it is much easier and thereby the working capacity of cable circuits is increased. Moreover, the semi-bridge duplex requires only about one-half of the artificial cable used in ordinary duplex systems, thereby saving much expense and space.

Practical Application.—In the year 1909 the newly invented system was applied to a cable of 672 miles which had been laid between Sasebo and Dairen (this route consists mainly of 130-lb. and 250-lb. copper, with some lengths of 200-lb., 100-lb. and 70-lb. in intermediate sections as well as some aerial lines connecting at both ends); and in 1910 to another cable of the same length between Nagasaki and Formosa (200-lb. copper and 180-lb. gutta-percha and some aerial lines on both ends) for duplex working and a very satisfactory result was obtained.

Only 320 nautical miles of artificial cable are being used on each of these two cables. Fig. 2 shows the arrangement in a balanced state of the system at the Nagasaki station.

Telephone Statistics Show Business Devlopment in South America.

Striking figures showing the development of the South and Central American Republics are made public as a result of a survey by the American Telephone and Telegraph Company. These statistics, which were prepared with the co-operation of the various governments, cover the telephone and telegraph systems of all the countries south of the Rio Grande. The figures are serviceable as indices to the general state of development and of commercial progress in the various American countries and should therefore prove of value to all interested in those countries.

Some of the conclusions reached from this survey are that in the Southern countries the telephone is far from being the extensive means of communication that it is in this country and that the main development there is in the big cities, the other areas being poorly served. The telephone network is about a hundred times as dense in this country, as a whole, as it is there. In point of the number of telephones per hundred of population, the service here is over thirty times as good.

Some of the important facts on which latest data are compiled for each of the countries are: Number of telephones and number per hundred of population; mileage of telephone wires; telephone development of the largest city in each country; investment in the systems; gross earnings and unit earnings; telegraph wire mileage, number of offices and number of messages, etc.

The total of 325,403 telephones in all the South and Central American countries, including Cuba and Haiti, should be compared with the twelve million in the United States, which have about the same total population. Argentine leads with 105,205 telephones, or nearly a third of the total. The other countries having more than 10,000 telephones are: Brazil, 67,366; Mexico, 40,211; Cuba, 28,-

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152; Chile, 23,670, and Uruguay, 19,486. Haiti, with a total of 2,500,000 people, has 82 telephones.

Only one telephone for about every 300 population is found in the whole area, as compared with 11.39 for every hundred of population in the United States at the same date, or about 34 for every 300 population. Uruguay leads the Latin-American countries in point of telephone density with 1.34 telephones per hundred people. The only other countries having as much as one telephone per hundred population are Argentine, Cuba and Panama. In the three countries having the highest telephone development, the systems are almost wholly under private ownership.

The total telephone wire mileage is 905,587, compared with 29,800,000 in this country. Taking into consideration the fact that the total area of the South and Central American countries is 8,476,600 square miles, comapred with the 3,027,000 square miles of the United States, there is only about one-tenth of a mile of wire for every square mile in the Latin countries, while there is nearly ten miles for every square mile here. This means that the telephone network is nearly a hundred times as highly developed here as down there.

The extent to which the countries are served by their systems is indicated by the figures showing the telephone development in the largest city in each country. Habana, Cuba, is the most highly developed, with 5.5 telephones per hundred population. Taking in all of Cuba, however, there is only one telephone per hundred people. Mexico City has 3.9 per hundred—Mexico as a whole has only 0.25 telephones per hundred population. These figures show how in the Southern countries the bulk of the systems are in the large cities, while the other areas are hardly served at all. This condition is contrasted with that in the United States. At the same date New York City had 11.7 telephones per hundred people—the United States as a whole had nearly as many, 11.39. Here is adequate service for even the smallest farm communities.

The investment in telephone systems in all the Southern countries together is $64,422,000, compared with $1,600,000,000 in the United States. The per capita investment is 71 cents in South America compared with $15.09 here. The highest investment is in Cuba, $2.28 per capita. The investment per telephone is perhaps even more significant. In Latin-America there is invested $198 for every telephone in service—in the United States this is only $132. These figures reflect the higher technical progress and the more efficient management, as well as the greater density of development, in this country.

The gross earnings in 1918 of South American telephone systems were only eighteen cents per capita, while in this country they were $3.99. The gross earnings per telephone were, however, $52.82 down there and only $34.98 here.

Of the total telephone and telegraph earnings in 1918 in the Latin countries, the telephones brought in only 43.5 per cent. of the total and the telegraph 56.5 per cent. In the United States this situation is strikingly reversed—80.8 per cent. from telephones and 19.2 per cent. from telegraphs. The total telegraph wire mileage is 433,938 down there and 1,900,000 here. The number of offices are 11,627 and 28,900, respectively. The number of messages sent in 1918 was 41,517,200 in the Southern countries as compared with 170,000,000 here.

The telegraph statistics, therefore, show a more favorable comparison with those of this country than do the telephone figures. The reason is that the telegraph is used more by a specialized class of the population, mainly for business. The telephone has not in the Latin-American republics come anywhere near being the universal and democratic means of communication that it is in the United States.

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American Telephone Manufacturers Organize Company in Argentine

G. E. Pingree, vice-president of the International Western Electric Company, has announced the organization of a new company in Argentine to take care of the telephone requirements of the countries in the lower part of South America. It will be known as the Compania Western Electric Argentina and is expected to form an important link in the group of subsidiaries which the American company has been establishing throughout the world during the past few years.

The capital stock of the new company consists of 5,000 shares of 100 pesos each. Its headquarters will be located at Buenos Aires. H. C. Mitchell, who formerly acted as resident manager for the Western Electric Company in South America, has been elected president of the Argentine Company. Americans are particularly interested in the new venture as the company has practically a virgin field. Previously all supplies required for the telephone system of Argentine and its neighbors were imported, a condition which seriously handicapped the growth of lines of communication below the Equator.

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American Capital Organizes Norwegian Telephone Manufacturing Company

The International Western Electric Company has completed the organization of a new Norwegian corporation to handle all of its Scandinavian business. It will be known as the Western Electric Norsk Aktiesekskap. Its headquarters are located in Christiania. Mr. E. A. Brofos, who has been representing the Western Electric Company in Northern Europe for several years, has been appointed manager of the new concern.

The new Norweigian company has already succeeded in securing several large contracts. One of them covers the supply and installation in Christiania of a full automatic telephone system consisting of 31,000 subscriber lines. It has also closed negotiations for the installation of an automatic system in Copenhagen for the Danish Government.

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International Telegraph Convention

Notwithstanding that the Bureau of International Telegraphy has been for forty-eight years centralized at Berne, Switzerland, inquiries from various directions show that acquaintance with the Bureau, and its composition and powers, is by no means general or accurate. From early in the fifties conferences of representatives of various Government telegraph departments were held from time to time until, in 1865, at the Conference of Paris, these gatherings were placed on a more systematic footing. The first International Telegraph Convention was concluded June 29, 1855, between certain of the central Continental States, including the present Republic of Germany, of Austria, Belgium and France, and as revision soon became necessary, the first International Telegraph Conference of representatives of the States which had previously, as stated, entered into mutual arrangement, was held in 1858, the result being the Brussels convention, dated June 30 of that year.

This convention is the basis upon which the existing telegraph convention has been built up; and considering how early in the history of telegraphy the Brussels conference took place, it is remarkable that so many of its provisions remain practically unaltered; although many of the rules have been transferred from the convention itself to the service regulations which accompany it, and which took their rise in the supplement attached to the Brussels convention.

Provision was made for the holding of another conference two years after; but it was not until seven years later that the next revision took place at Paris when, in adition to the several states named, Denmark, Spain, Greece, Portugal, Russia, Sweden and Norway, were represented; and the result was the first Paris convention (with supplement) of April 18, 1865. Arrangements were made at this assembly for the holding of periodical conferences in the various European capitals and that at Paris was followed by others at Vienna in 1868, Rome 1871-72 (when the submarine cable companies were first represented), St. Petersburg, 1875 (the convention agreed to which remains in force), London, 1879, Berlin, 1885, Paris, 1890, Budapest, 1896, London, 1903, and Lisbon, 1908.

The International Telegraph Convention prescribes, among other things, for the priority of government and service telegrams; the strict secrecy of messages, their prompt despatch and delivery, and the regulation of accounts between the contracting parties. But the states adhering to the convention do not accept any responsibility on account of the service of international telegraphy, and reserve the right "to stop the transmission of any private telegram which may appear dangerous to the security of the State, or which may be contrary to the laws of the country, or to public order or decency." Each adhering Government also has the power to suspend its telegraphic service "for an indefinite period, if it judges necessary, either generally or only upon certain lines for certain classes of correspondence," the sole condition being that notice shall be given to the other contracting States in order to facilitate the proper working of the convention. Any State can adhere to the convention on request. Also any State may renounce its adhesion. The convention remains in force indefinitely, or for a period of one year from the date of its denunciation by any State, its general renunciation by the contracting States.

"International Service Regulations" have been annexed to the convention, and it is decreed that these regulations shall possess the same authority as the convention itself. While the convention remains the document under the terms of which international telegraphy is conducted, the tariffs and service regulations are subject to revision by successive conferences, which take place about every five years; each conference fixing the time and place of the next meeting. Delegates are appointed by the contracting States to attend these conferences, each administration having a right to one vote. The revisions resulting from the deliberations of the conferences only come into operation after they have been approved by all the Governments of the contracting States. There is nothing to prevent the States making separate arrangements among themselves, so long as these have no general application.

After specifying for the electrical condition of the wires, and certain arrangements for testing, etc., the service regulations prescribe: (a) the manner in which telegrams must be written—as to clearness of writing, in plain as well as secret language; letters, figures, signs of punctuation, forms of address, and similar details; (b) the method to be adopted in counting words; (c) tariffs for international telegraphic traffic; (d) the signals which are to be used in telegraphing letters, figures, signs of punctuation, official instructions, etc.; (e) the regulation of traffic in the event of interruption to the normal means of telegraphic communication; (f) the delivery of telegrams by the office of destination; (g) the regulation of interstate and international telegraphic communication, and (h) the preservation for a given period of all originals of telegrams and documents relating to telegrams.

Plain and secret language for telegraphing purposes is defined, and it is decreed that no word of more than ten characters of the Morse alphabet can be employed in code messages. Article VIII. of the Budapest revision of the regulations decrees that:

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"From a date to be fixed by a future conference, all the words employed provided in private telegrams written in code language shall be taken from the duly augmented official vocabulary prepared by the International Bureau of the Telegraph Administrations." Cipher messages (formed of groups of figures) have to be made up exclusively of Arabic figures.

The order in which telegrams are transmitted are (1) Government, (2) service, (3) urgent private, (4) non-urgent private, (5) press messages; and it is decreed that the originals of telegrams and documents relating thereto are to be preserved for at least eight months under the European, and for twelve months under the extra-European regime. The European regime comprises all the countries of Europe, as well as Algiers, Tunisia, Tripoli, Russia in Caucasus, Turkey in Asia, Azores, Senegal, the coast of Morocco, and other countries situated outside Europe which are declared by the respective administrations to belong to this regime. The extra-European regime comprises all the countries not included in the preceding enumeration.

All alterations of tariffs, both internal and international, the opening of new lines and the closing of old lines, so far as they affect international traffic, the opening and closing of offices, the interruption and restoration of telegraphic communication, etc., are notified to the international office either by printed or written documents or telegrams. In a similar manner any reports or communications affecting international traffic, statistical tables showing growth of traffic, the situation of lines, the number of offices, instruments, etc., and information respecting all experiments, instituted in the different branches of the service by the contracting administrations are forwarded to the international bureau.

The international bureau, which was formally established by Article 16 of the Vienna convention, was organized by the chief administration of the Swiss Confederation, and it is expressly stipulated that the expenses of this office must not exceed the sum of 100,000 francs (say $20,000) per annum. This amount does not include special expenses caused by the extra services rendered by the bureau to the international conferences, and the sum of $20,000 may, of course, be increased by consent of the contracting States. The Swiss telegraph administration supervises the expenses, makes the necessary advances, and prepares the annual accounts, which are communicated to all the administrations interested, these being, for the purposes of accounts, divided into 1st, 2nd, 3rd, 4th, 5th and 6th classes. Administrations of the 1st class bear twenty-five parts of the total expense; 2nd class, twenty; 3rd class, fifteen, 4th class, ten; 5th class, five; and 6th class, three parts. The co-efficients referred to are multiplied by the number of States of each class, and the sum of the products thus obtained shows the number of parts by which the total expense of administration is to be divided, the quotient representing the value of a part. The telegraph and cable companies (whose "enterprises," by the way, by Article LXXXVI., form an integral portion of the International telegraph system) are (by courtesy, but not by right) invited to the conferences, and representatives of the companies are present at the deliberations of the delegates, but do not vote. The classes were made up as follows:

1st class: Germany, Argentine Republic, Brazil, France, Great Britain, British India, Italy, Russia, Trukey; 2nd class: Austria, Spain, Hungary; 3rd class: Belgium, Dutch East Indies, Norway, Holland, Roumania, Sweden; 4th class: South Australia, Cape of Good Hope, Denmark, Egypt, Japan, New South Wales, New Zealand, Queensland, Switzerland, Victoria; 5th class: Bosnia-Herzegovina, Bulgaria, Cochin-China, Greece, Portugal, Portuguese colonies, Senegal, Servia, Siam, Tunisia; 6th class: Western Australia, Luxemburg, Montenegro, Natal, New Caledonia, Persia, Tasmania.

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Telegraph Insulator Lost in Tree

Thirty-six years ago a telegraph bracket and insulator was nailed to a Douglas fir tree near Avcata, Cal. A few years later a falling branch badly damaged it and the wire which it had been supporting was removed. The tree was growing thriftily, adding every summer to its diameter a new layer of woody material and this growth gradually pushed out around the bracket on all sides, leaving it buried in the tree trunk.

At the end of twenty-six years the tip of the glass insulator finally disappeared from view and the only trace of it that could still be seen was a scarcely noticeable lump which looked like nothing more than a healed-over branch stub, says a writer in *The American Forestry Magazine*. A few weeks ago the tree was felled and the wood manufactured into barrel staves. The screech of the saw which happened to graze the edge of the glass called attention to the unusual fossil.

On splitting open the stove bolt the story became clear in its details. The clearly defined annual rings of the rapidly growing tree forms an unimpeachable historical record. The wood of the insulator bracket is still in good condition, and the oak of which it was made received an unintentional preservative treatment, having been thoroughly impregnated with the resin of the surrounding fir. The interesting specimen went to the wood collection of the forestry division of the University of California.

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Punctuations Included

The telegram was plainly written: "Have shipped them. Remit at once." The operator sent it that way—even the period, but the delivered copy read: "Have shipped the mud remit at once."

Yes; it was on a Morse wire, and the receiving operator is now in another line of business.

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EDITORIAL COMMENT

Identification of the Inventor

The question is often asked: "Who are the prominent telegraph inventors of today who have taken the places of the Farmers, Weinys, Millikens, Stearnses, Freirs and Atkinsons of other days?" And the thought back of the question is not that telegraph invention and improvement have ceased, but rather that in the management of the business a time has arrived when supposedly for reasons of abstract policy it is thought best to give to newly developed devices and systems names which indicate principles of operation rather than names which identify the inventors thereof.

The change has taken place gradually through a decade or more, and in the same sense has been noticeable in other callings. On the sea the fighting ship *Admiral Sampson* has become the S-44, and the massive and beautiful sky-scraper, instead of being named after its designer or owner, is now more likely to be called the Leather Trade Building.

So far as the telegraph business is concerned, there is no question that the old custom of giving to new developments the name of the originator served as a potent spur to inventive activity. Also, the achievements of a given period in the history of an industry stand out plainly when methods and systems in use bear the names of the inventors.

A disturbing cry has gone forth during the past few years that industry must be humanized; which, in view of the fact that unrest as we know it today is of comparatively recent birth, may signify that industry has been dehumanized. Humanizing a cross-roads cheese factory, an industry, or a nation is predicated upon recognition of the elemental fact that the whole is made up of units and that the units are human beings. The unit—the man—if he is to contribute constructively must have a personal pride in his work. Pride in personal achievement is doubly inspired when extraordinary accomplishments are adequately—that is, publicly, recognized.

It may be that there are more generally satisfactory means of rewarding inventive genius than by labeling each new creation with the inventor's name, but it would be a vain search endeavoring to locate a man who had made a material step forward in any line of work who would demur at having his name appear as the inventor.

The International Communications Conference

The International Communications Conference, originally scheduled to meet in Washington on September 15, has been postponed to a later date.

The Conference was agreed upon by the Allied and Associated Powers at Paris, in May, 1919. Congress in an act approved on December 17, 1919, requested and authorized the President in the name of the Government of the United States to call, at his discretion, an international conference to assemble in Washington, and to appoint representatives on the part of the United States to consider all international aspects of communication by telegraph, telephone, submarine cable, wireless telegraphy and wireless telephony. As representatives of this country the President appointed A. S. Burleson, postmaster-general; W. S. Rogers, of the Washington *Herald*, and Admiral W. S. Benson, chairman of the Shipping Board.

Later, Norman H. Davis, Under Secretary of State, sat in as a member of the American delegation, and at a preliminary meeting of the American representatives held in Washington on September 15, the chairmanship was transferred from Mr. Burleson to Mr. Davis, and it was given out that Mr. Burleson would remain as honorary chairman.

The naming of Mr. Davis as chairman was an excellent move, as there had been objection from various quarters to Mr. Burleson continuing to direct the work of the American representatives.

It was announced on September 10, that preliminary to the main conference, representatives of Great Britain, France, Japan and Italy would meet in Washington on October 8, to determine the date and prepare for the conference.

The conference will be of world-wide character. Its scope will cover the whole field of electric communication between nations.

W. G. McAdoo, former secretary of the treasury, has been retained by the Western Union Telegraph Company to represent its interests before the conference, while Robert Lansing, former Secretary of State, is to represent the interests of the Postal Telegraph-Cable Company and the Commercial Cable Company. It is stated, also, that Elihu Root, Jr., son of former Secretary of State Elihu Root, will represent the interests of the All America Cables, Inc.

On all hands it is hoped that the delegates to this important conference will be able to iron out the difficulties of long standing which have been the cause of misunderstandings, and which have, along certain lines, resulted in restricting the amount of traffic presented for transmission.

Our Technical Examinations

Elsewhere in this issue of TELEGRAPH AND TELEPHONE AGE we publish the names of those of our students who have been awarded ratings totaling seventy-five per cent. and higher for answers sent in to the examination questions recently submitted. The papers of those whose marks ran below seventy-five per cent. are being returned to the writers with corrections made showing correct answers.

This initial trial examination has been a pronounced success and we are gratified that our efforts in behalf of studious telegraphers in the United States and Canada are appreciated.

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SUBMARINE CABLE WORKING

By A. G. Williams, Sr.

A submarine cable may be compared to a pipe line with tanks or condensers at each end. With the pipe filled with water, the water contained in the two tanks will balance, and maintain a certain static pressure.

The cable conductor acts in a similar manner. The cable contains a static charge of electricity which may be acted upon by the electric pressure at either end of the line. To gain a clearer idea of how a cable conductor may be "duplexed," that is, so equipped with terminal apparatus that one message may be transmitted in each direction at the same time, it is instructive to consider the action of water in a long pipe.

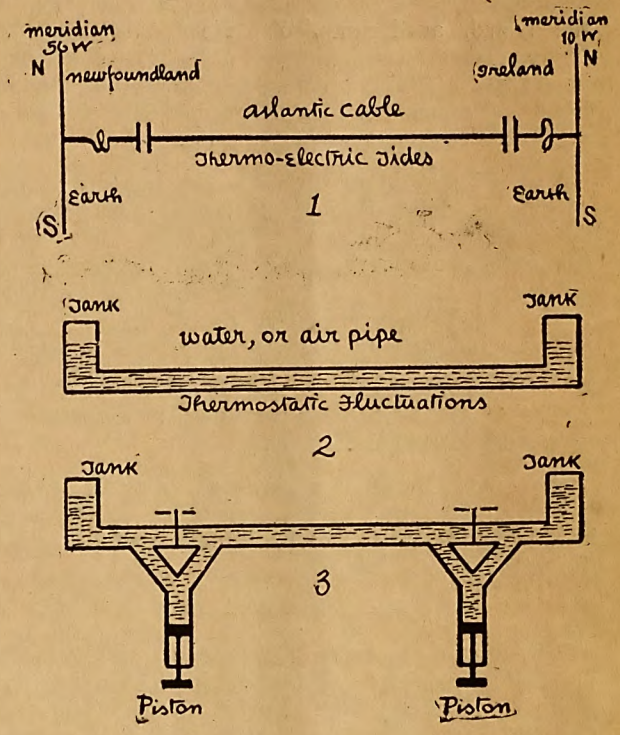
To operate the pipe line hydromotive force—a pump—is used, whereas a cable line is operated by electromotive force. Impulses to and fro are evidenced by waves of energy. In regular signaling these waves may be regarded as resulting when the sending key is operated in transmitting the dots and dashes of the telegraph alphabet. A line conveying water or electricity is operated by a series of "pushes" and "pulls." In the case of electric circuits these effects are called negative and positive.

It is known that between points remotely separated a regular ebb and flow of current occurs every six hours, due to the sun's heat bearing with maximum effect upon each successive meridian. As the earth revolves each meridian receives at a given time a maximum degree of heat, and tidal waves follow the sun in its course.

In the accompanying diagram, 1 represents an Atlantic cable between Newfoundland and Ireland, with coils and condensers indicating the position of the signaling apparatus. The ground is represented by the meridanal line. Valencia, Ireland, longitude 10 W, and Hearts Content, Newfoundland, 56 W, are about 1,900 miles apart in cable length. The condensers interrupt the metallic circuit at both ends of the line, so that as the cable is operated it is evident that the static charge of electricity contained in the cable conductor simply sways to and fro in response to the occasional charges given by the respective terminal batteries.

At 2, in the illustration, is shown a pipe line containing water. If a source of heat is applied to the pipe at one end the water will expand, imparting an impulse to the contained liquid. When the source of heat is removed contraction follows and a reverse movement of the water takes place. This is analogous to the action of a battery in imparting a charge to a conducting wire. When the sending key is depressed the generation of heat in the battery is followed by the projection of a charge of electricity into the wire, and when the key is opened it may be observed that the line discharges in a direction the opposite of the charge.

At 3, in the illustration, the pipe line is arranged with a pressure pump at each end so that the student may study the action of currents transmitted from both ends of the line separately or simultaneously. Comparing this arrangement with a bridge duplex cable system, the Y extensions represent the bridge connections; the piston, the sending key; the tanks, the condensers. When the plunger is pushed into the pipe, the home indicator remains stationary because the pressure of water on either side is the same—one-half of the water in the pipe off-set flowing into the tank and the other half into the main pipe.



In the case of a water pipe system the indicator would be water pressure gauges, and in the illustration these are shown in conventional line relay symbols. If the piston on the right is pushed upward it is apparent that the pressure on the diaphragm (armature) of the indicator will be equal at that end of the line, but the diaphragm at the distant end—on the left—will respond to the incoming current and register an indication. This action is closely analogous to what takes place in a duplex telegraph circuit and illustrates why the home sending keys when operated do not cause signals to be registered on the home relay, while they do cause the distant relay to operate.

In the cable circuit, when the sending keys are depressed at the same instant at each end of the line identical polarities are presented; the opposing battery resulting in no current flow to line. The fact, however, that no current can flow into the line conductor does not mean that there is no outlet for the current, as the artificial line (condensers) present a path through which current impulses may flow. Thus, the home station sending key causes to be registered on his own recording instrument the signal which would have resulted from battery application at the distant station had opposing polarities not been presented at that particular instant.

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Radio Telegraphy

Radio Corporation of America Notes

PRESIDENT E. J. NALLY was the guest of honor at a dinner given by Mr. O. D. Young, chairman of the board, at Delmonico's, New York, on Mr. Nally's return from Europe recently. The guests included A. G. Davis, vice-president of the General Electric Company, and a number of the officers of the Radio Corporation of America.

THE HEAD OFFICE STAFF to the number of seventy-three recently enjoyed a theatre party preceded by a dinner at the Cafe Boulevard, New York. Commercial Manager David Sarnoff acted as toastmaster, and short addresses were made by President Nally and Treasurer George S. De Sousa. Dancing was indulged in, and the affair was a decided success.

GEORGE S. DE SOUSA, treasurer, is spending his vacation at Atlantic City, N. J.

WILLIAM COCKETT, auditor of receipts, has returned to duty after tedious treatment for a wound in the leg received in France many months before the armistice was signed.

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THE NEXT REGULAR MEETING of the Institute of Radio Engineers will be held in the Engineering Societies Building, New York, on the evening of October 6, at which time a paper will be presented by Dr. Alfred N. Goldsmith and Edward T. Dickey on the subject "Radio Taste Reception." The use of the sense of taste for receiving radio signals has been experimentally investigated in several ways, and the practical results obtained will be described at this meeting of the Institute.

AT THE ELECTRICAL SHOW to be held in New York, beginning October 6, various radio manufacturing companies will have extensive exhibits of their products. Demonstrations of radio telegraphy and radio telephony will be given.

C. V. LOGWOOD, of the De Forest Radio Telephone and Telegraph Company, New York, is now located in San Francisco, Cal., in the service of the De Forest Company.

M. C. RYPINSKI, electrical engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has been placed in charge of radio sales for that company.

ERNST F. W. ALEXANDERSON, chief engineer of the Radio Corporation of America, was born at Upsula, Sweden, on January 28, 1878. He was educated at the High School and University of Lund, Sweden, and at the Royal Institute of Technology, Stockholm. Later, he completed a post-graduate course in Berlin, Germany. He was a member of the engineering staff of the General Electric Company, Schenectady, N. Y., from 1902 until his appointment a few months ago as chief engineer of the Radio Corporation.

S. KRUSE, assistant engineer, Bureau of Standards, Washington, D. C., presented a paper before the members of the Radio Club of America, in the Engineering Building, Columbia University, New York, on the evening of September 24, the title of which was "The Bureau of Standards' Tests of Short Wave Radio Signals."

ECUADOR, on April 17, 1920, acceded to the International Radio Convention and the final protocol, which was signed in London, England, on June 5, 1912.

IN BOLIVIA a new radio telegraph station has been opened at Trinidad, the capital of the department of Beni.

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Direct Radio Service Between Argentina and Germany

A new German-Argentine radiotelegraph company has been organized under the name of the "Transradio," for the purpose of establishing direct radio service between Germany and the southern countries of South America. The capital of the company will be 10,000,000 pesos ($4,300,000), of which, it is claimed, 4,500,000 pesos are already subscribed in Germany. Subscriptions for stock are being received in Argentina, where considerable publicity is being given to the project. It is advertised that the station will be ready for use early in 1922 and that commercial messages will be sent at rates equal to approximately one-third of the present cable rates.

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New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

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Wide Expansion of Trans-Ocean Wireless Assured

Of major importance in perfecting the world-wide extension of radio communication are recent arrangements consummated by the Radio Corporation of America, through its president, Edward J. Nally, who returned from a European trip on September 6th. He visited England, France, Germany, Belgium, Norway, Sweden, Denmark and Poland, holding a series of conferences with representatives of all the important wireless interests and the government officials concerned with radio in the several countries.

Mr. Nally announces that long term traffic agreements were made for communication with England, France and Germany. Commercial arrangements affecting the future operation of the existing and highly satisfactory trans-ocean service to Norway were also perfected. Another agreement was made for a new service to be created by a special arrangement made in France through which provisional communication will be maintained between the Bordeaux or Lyons stations and the Radio Corporation's station at Tuckerton, N. J. Rehabilitation of the American station has already begun; Alexanderson alternators will be installed, the antennae will be greatly extended and a power line constructed for current supply from Atlantic City. Tuckerton will be connected by wire line with the main operating office in New York City and will be used solely for transmitting; the station at Belmar, N. J., will receive the messages from France. Later, this branch of overseas communication will be concentrated in the New York Radio Central Station, now being erected on Long Island, one of the five units of this gigantic station being allocated to France to maintain communication with a new super high-power station which is being constructed in the vicinity of Paris.

Other high power installations are to be made in stations located in Denmark, Sweden, Belgium and Poland. In the existing British trans-oceanic station in Wales, which maintains communication with Belmar and New Brunswick, powerful Alexanderson alternators and new antennae will be installed, equipping the plant for operation on continuous waves and greatly increasing its message capacity. Marconi's Wireless Telegraph Co., Ltd., will also construct an overseas high power station for communication between England and South America in conjunction with the group of trans-oceanic plants which the Radio Corporation of America will erect in the vicinity of Buenos Aires for communication with New York.

The arrangement made with Germany for the exchange of commercial messages takes the form of a long term contract with Dr. Bredow, Director of the Ministry of Posts and Telegraphs, which will become operative immediately with the proclamation from the United States of peace with Germany. Meanwhile the messages which heretofore have been handled by the naval station at Annapolis will be transmitted by the Marion, Mass., station of the Radio Corporation.

Dr. Bredow has issued an official statement on the Radio Corporation's contract, announcing it a formal communication license and offsetting published reports that other radio interests in the United States had obtained concessions in the form of traffic agreements. The German Ministerial Director says of the agreement with the Radio Corporation: "The opening of this new connection is of the greatest importance to Germany, as now for the first time since 1914, it becomes possible to exchange telegrams free from London control, not only with North America, but also with Central America, South America, Japan and China." Noting that before the war 7,600,000 words per year were handled over the two German cable connections with North America and these, together with one cable connection with South America, were hardly sufficient for the traffic, Dr. Bredow states that an independent means of wireless communication was desired and that the new American radio connections made will contribute greatly to the development of commercial relations between the two countries. This observation is also included: "Tests were made between Nauen and Marion in order to determine the speed and reliability with which service could be carried on between these two most powerful stations of the old and the new world. These tests demonstrated the possibility of working duplex at high speed." He speaks, then, of the negotiations with the Radio Corporation and the necessity of obtaining formal permission from the German Government before starting its service, for which purpose Mr. Nally went to Berlin, "with the result that the American company will be formally licensed to communicate with Germany on the day of the termination of the state of war between Germany and the United States. Until such time," Dr. Bredow concludes, "the traffic will be handled without special arrangements as it has been with the American naval station."

The Radio Corporation of America announces that the service is now in operation and commercial communication between the Marion and Nauen stations is being carried out with great success.

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Amateurs in Great Britain

The new rules governing amateur operation of radio apparatus in the British Isles provide that no amateur may erect an aerial more than 100 feet in height, or more than 100 feet above the ground. Other restrictions govern the transmitting power permitted and the wave-length of amateur stations. There are forty-one amateur radio clubs in the United Kingdom, with a membership of over 1,500.

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On the Evening of November 28, 1911, when Sir Edward Grey made his famous address on the Moroccan question, press matter to the extent of 2,000,000 words was transmitted by telegraph from the London office.

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THE STORY OF THE PACIFIC CABLE

The following interesting account of the laying of the British Pacific cable is taken from Mr. G. H. Scholefield's book "The Pacific: Its Past and Future," published by John Murray.

A Scientific Fallacy.—By one of those inscrutable assumptions which science has permitted, it was supposed for many years that the great depth of the Pacific Ocean would preclude absolutely the laying of a submarine cable across it to connect Canada with the Australasian colonies. This belief was accepted implicitly at the Colonial Conference held in Sydney in June, 1877, to consider the improvement of telegraphic communication between Australia and the rest of the world.

Four main projects were then discussed. Three of them proposed to lay cables by way of Asia, and the fourth by way of the United States. The practicability of the schemes was considered by the Agents-General in London, and the route from New Zealand to Honolulu and thence to San Francisco was condemned as absolutely impracticable owing to the depth of water. Two years later, in 1879, Mr. (afterward Sir) Sandford Fleming, chief engineer of the Canadian Pacific Railway, discussing the early completion of the overland telegraph from the Atlantic to the Pacific, suggested that "as a matter of imperial importance the British possessions to the west of the Pacific Ocean should be connected by submarine cable with the Canadian line. Great Britain will thus be brought into direct communication with all the greater colonies and dependencies without passing through foreign countries."—(Mr. Fleming to the Superintendent of the Telegraph and Signal Service, Ottawa, 11th June, 1879.)

In his report the following year, Fleming developed his idea, insisting that a trans-Pacific cable to Asia should have its American end on Canadian soil. He asked personally to be granted the exclusive privilege of landing such a cable in Canada, and urged that as the most favorable route to India, Australia, and New Zealand was via Japan, one of the Kurile Islands should be transferred to the British Crown. The last proposal was dropped, but by the end of the year Japan had agreed to the landing of the cable at any suitable point in the island of Yezo. It is to the credit of the Canadian Government and the House of Commons that they took a pioneering interest in Fleming's proposals and granted him the desired charter.

Fleming was not disposed to accept the existing knowledge of the physical conditions of the Pacific as conclusive or the deductions as sound. He asked that one of Her Majesty's ships stationed at Esquimalt should undertake a detailed survey of the proposed route.

The Polynesian Route Proposed.—Five years elapsed without any headway being made. In 1885 Fleming published a pamphlet in London in which he boldly declared for the direct route from Canada to Australia through Polynesia, a route which has hitherto been condemned as impossible. He also suggested the payment of an annual joint subsidy of £100,000 by the governments of Great Britain, Canada, Queensland, New South Wales, Victoria, Western Australia, Tasmania, and New Zealand.

The proposal to lay a cable from Australia to the United States was discussed at some length in Australia, and Earl Stanhope took the hint and addressed a circular letter to the whole of the colonies, suggesting that the American terminus should be in Canada rather than in the United States. When the Colonial Conference met in London in 1887 Sir H. T. Holland was in the chair, and he expressed in a rather off-hand manner the Government's attitude to a proposal towards which it had shown nothing but impatience.

"A very strong case would have to be made out," he said, "to justify Her Majesty's Government in proposing to Parliament to provide a subsidy for maintaining a cable in competition with a telegraphic system which, at any rate, supplies the actual needs of the Imperial Government."

Sir Julius Vogel, Colonial Treasurer of New Zealand, suggested a joint ownership of the cable by the colonies and the Mother Country, but the discussion did not reach as far as this. The conference merely agreed on a resolution from Canada, urging the British Government "to set at rest by a thorough and exhaustive survey every doubt as to the practicability" of the Polynesian route.

The Admiralty would not agree to send a vessel specially for the purpose of taking soundings over the whole route, but promised to endeavor to arrange that soundings should be taken gradually during the next few years in the ordinary course of hydrographic surveying. This was in May, 1887. The Secretary of State excused the delay by the observation that there was no prospect of sufficient funds being found for the maintenance of such a cable.—(Colonial Office to Governor-General, Canada, 1st September, 1887.)

In a later despatch the Colonial Secretary said he could hold out no hope for the scheme being favorably received, and that the colonies themselves would have to provide the money for cost and maintenance. Nothing at all was done in regard to the survey, and when the Intercolonial Postal Conference met at Sydney in March, 1888, it could only pass similar resolutions afresh and offer to pay the cost of the survey.

The Survey Untouched.—The position was just the same when the Intercolonial Conference met at Ottawa in 1894, seven years after the conference in London. Nothing at all had been done on the survey, and again resolutions were passed praying the British government to move its departments to assist. To show that they were in earnest, the colonies decided to call for commercial offers for laying the cable. As a result it was found that several firms were willing to survey the route and lay the cable at less than the estimated cost.

Once again it was the galvanic personality of Chamberlain that infused life into a drooping empire cause. In November, 1895, the new Colonial Secretary decided that no further time should be lost, and on his suggestion there was a meeting of the Agents-General in London a week later. They

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unanimously recommended the setting up of an expert commission to report on the project, and a few months later this was done by Chamberlain himself.

When the report of the Imperial Pacific Cable Committee was signed on 5th January, 1897, the Pacific cable was almost an accomplished fact as far the main obstacle—official indifference—was concerned. Its practicability was endorsed. State-ownership was emphatically recommended. The route proposed was from Vancouver via Fanning Island, Fiji and Norfolk Island to New Zealand and Queensland. The interest of Chamberlain was a driving force in striking contrast to the obstinate and defiant indifference of the Colonial Office throughout the previous fifteen years.

"In any matter in which the colonies themselves are deeply interested," he said in opening the Colonial Conference of 1897, "they may count on the support and assistance of the mother country. . . . I think that one of the very first things to bind together the sister nations is to have the readiest and the easiest possible communication between the several units."

That conference itself did not advance the question, but before they next met it was accomplished, in spite of influences which kept the committee's report back from the public for two years.

Construction of the Cable.—In 1899 H. M. S. *Egeria* surveyed the line from Vancouver to within 300 miles of Fanning Island. On 31st December, 1900, the contract was signed for the construction of the cable. Toward the end of 1902 the cable was completed. A few months later the American cable from California to Hawaii was opened.

During the protracted discussion over the project, extending over a quarter of a century, the prospects of various islands being used as landing stations were mooted, and the British government did take steps from time to time to secure such as it thought desirable. In 1893, when Sir Mackenzie Bowell, Canadian Minister of Trade and Commerce, visited Australia in connection with the scheme, he was much impressed by the situation of Neckar Island (latitude 23 deg. 35 min. N., longitude 164 deg. 39 min. W.) as a midway station. Lying 240 miles to the westward of Hawaii, it was then derelict and uninhabited, and Fleming had strongly recommended it as being on the most direct route from Vancouver to the coast of Queensland.

An Acquisitive Project.—Neckar was discovered by La Perouse in 1786, and was considered by him too insignificant to take possession of. While in Hawaii Mr. Bowell made a memorandum strongly recommending that steps be taken to bring it under the British flag. Hawaii itself was in the throes of a revolution and on the threshold of annexation, and Lord Ripon, then Colonial Secretary, held this to be a reason for delaying action "pending the establishment of the government of Hawaii upon a more permanent footing." When the new government came into power it was composed almost entirely of Americans or persons of American sympathies. Month after month passed without any action being taken.

In May, 1894, Lord Rosebery, who had come into office as Foreign Secretary, assured Canada that the British representatives at Honolulu would "watch the matter closely," but he, too, thought that no action should be taken in view of the disturbed condition of Hawaii. Fleming, though, was less patient. He was intensely anxious to insure that the British flag and no other should float over Neckar, and that it should be there as an accomplished fact when the conference met at Ottawa. And to forestall disappointment, he decided in his private capacity to arrange for the occupation of the island by a British subject, and the hoisting of the British flag. Sir Charles Tupper duly communicated the project to the colonial office. The result was a complete damper. "Roseberry much annoyed at action," he cabled to Fleming on May 31. "Will repudiate. Fears will destroy good prospect of obtaining Neckar. Prevent action becoming public, if possible."—*Telegraph and Telephone Journal, London.*

Chinese Republic Honors American Telephone Expert

Patrick T. Carey, who superintended the installation of the present telephone system in China, has been decorated by the Chinese Government. Mr. Carey has been made a member of the Fifth Class of the Joy Ho, the Chinese Order of Merit, as a reward for his services. The medal signifying his membership in the order was presented to him recently by Tsend Yu Chun, Minister of Communications.

Mr. Carey, who is well known in American transmission circles, has been acting as instructor of telephony at the Government University in Pekin since 1917. In addition, he is Superintendent of Installation of the China Electric Company, the Chinese subsidiary of the Western Electric Company of New York. In 1909 Mr. Carey installed the South and East exchanges in Pekin. These were the first common battery installations ever introduced into China. In 1912 he made additions to the service in Pekin and also erected exchanges at Tientsin and Tsinanfu. The equipment in all of these exchanges was exactly the same as that used in the latest American telephone systems.

Your Money's Worth

One would have a hard job finding anything of use which today sells for the same price it sold for before the war. Everything that goes into manufacture and production of any sort has increased in cost 100 per cent. or more. Telegraph and Telephone Age, however, is not only still selling at pre-war figures (two dollars per year), but it is a more useful journal today than ever before. If the reader is not a regular subscriber he should lose no time in sending in his name while the present low subscription rate remains in force.

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TECHNICAL EXAMINATION

For Telegraph Students.

In the August 16, 1920, issue of Telegraph and Telephone Age, a list of twenty technical questions was submitted to the students who are following the course in Technical Telegraphy now running in this journal.

A report of the examination papers sent in shows the following students received ratings of seventy-five per cent. or higher:

George L. Berry, Ottawa, Ont., Canada	100%
O. A. Carroll, North Platte, Nebraska	100%
H. L. Graham, Jenkins, Kentucky	100%
E. B. Lowry, San Antonio, Texas	100%
John Monshausen, Galveston, Texas	100%
A. J. Roach, Galveston, Texas	100%
Howard Edward Hausinger, Galveston, Texas	99%
S. G. Givens, Ravenna, Kentucky	98%
W. J. Hurst, Galveston, Texas	98%
Edwin S. Siercovitch, Galveston, Texas	98%
J. M. Carson, Statesville, North Carolina	97%
E. W. Frye, Peoria, Illinois	97%
L. B. Snodgrass, Ellis, Kansas	97%
J. O. Browning, Russellville, Kentucky	95%
Daniel L. Henneberry, Montreal, Que., Canada	95%
L. C. Mercer, Ingram, Pennsylvania	95%
J. W. Sink, Xenia, Ohio	93%
Olive G. Ashford, Lawrence Kansas	91%
George J. Boehm, Jr., Brooklyn, New York	91%
Philip T. Read, Columbus, Ohio	91%
J. H. Gordon, Pittsburgh, Pennsylvania	90%
A. F. Sherwood, Chicago, Illinois	89%
W. Grey Hendrixson, Montoursville, Pennsylvania	88%
D. T. Jarrett, Fresno, California	88%
A. P. Parks, Fort Scott, Kansas	87%
Walter E. Zube, Lacrosse, Wisconsin	84%
Robert M. Cooper, Indianapolis, Indiana	83%
Clifford Kennedy, Ottawa, Ont., Canada	81%
C. Weinstein, Toronto, Ont., Canada	75%

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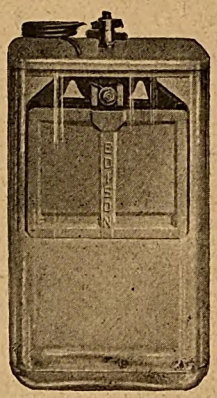
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

CABLE CIPHER CODES

We have made the subject of cable cipher codes a study for over thirty-five years. There are many hundreds of codes on the market that have been offered to the public at one time or another. We are familiar with the most prominent of them. This publication is headquarters for all cable codes. Many telegraph managers direct their inquiries for information on the subject of codes to the publisher of a particular code, who usually answers that he never heard of the book for which information is sought, but his own code will, no doubt, meet every requirement. As we deal in all codes without favoring any particular one, we are naturally headquarters for the different code books and are, therefore, in possession of information concerning most all of them. Bear these facts in mind when you have inquiries from your customers for codes, and direct your orders to

Telegraph and Telephone Age
253 Broadway, New York

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

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THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

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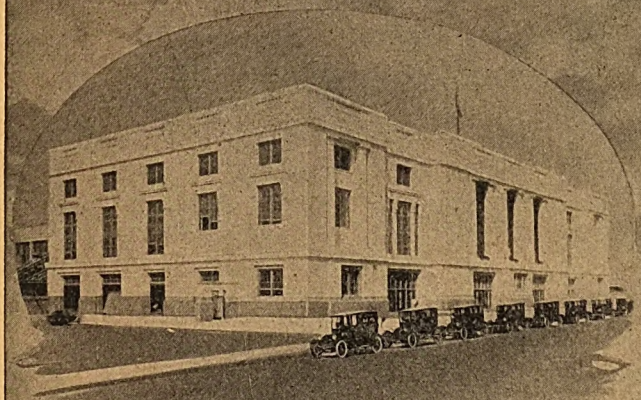
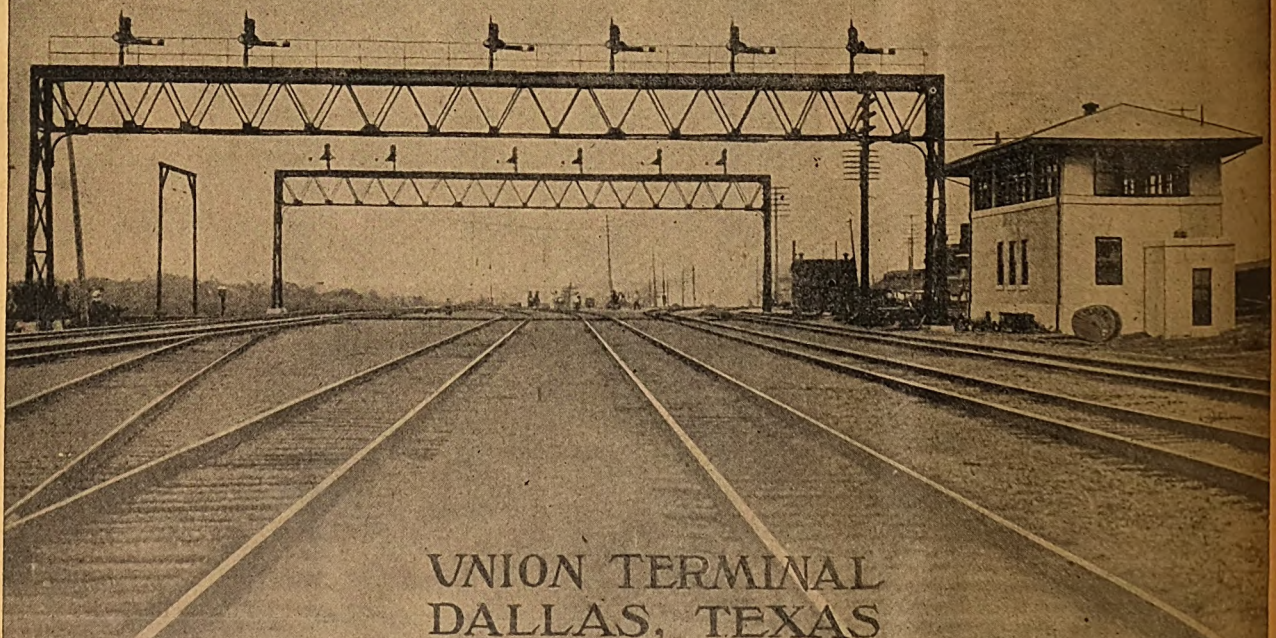
KERITE





UNION TERMINAL
DALLAS, TEXAS

KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO

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American Railroad Association

Telegraph and Telephone Division

Important Reports Acted Upon at Winnipeg Convention Held September 22, 23 and 24.

Committee No. 4—Protection Against Lightning Electric Light and Power Circuits, submitted to e convention a very comprehensive report. The rtion of the report ballotted upon for inclusion in e Division's manual of specifications reads as llows:

ssential Elements for the Electrical Protection of the Telegraph and Telephone Plant

To provide maximum protection to employees, uipment and buildings from injury or damage id to minimize the interference to service which ight be caused by lightning or electric light and ower circuits, the following recommendations are ade to cover two general classes of plant:

A. Wires and apparatus owned by railroads.

B. Wires and apparatus not owned by railroads.

. Wires and Apparatus Owned by Railroads

With exceptions as listed below, all telegraph and elephone wires entering buildings shall have in cir- uit between the exposed portion of the line and ie station apparatus, the following protector equip- ient in the order named:

First—Line fuses.

Second—Cable arresters where required.

Third—Office arresters.

Fourth—Instrument fuses or heat coils.

Line Fuses shall be of seven to fifteen amperes apacity, depending upon the class of plant they are o protect.

Cable Arresters shall be of a type suitable for he cable they are intended to protect. In no case hall an arrester be used which, after installation nd assuming reasonable maintenance, will operate n a voltage below that required to operate an ar- ester composed of two copper blocks having clean, smooth faces, separated by an air space of 0.005 to 0.0055 inch thick; nor shall any arrester be used aving an operating voltage higher than that which he cable to be protected can safely withstand.

Office Arresters shall be of a type suitable for he plant and service they are intended to protect. In no case shall an arrester be used which, after installation and assuming reasonable maintenance, will operate on a voltage below that required to operate an arrester composed of two carbon blocks having clean, smooth faces, separated by an air space 0.005 to 0.0055 inch thick; nor shall any arrester be used having an operating voltage higher than that required to operate an arrester composed of two copper blocks having clean, smooth faces, separated by an air space 0.005 to 0.0055 inch thick.

Instrument Fuses or Heat Coils shall not exceed one ampere capacity.

Locations

Office arresters shall be located within the office, building, or shelter in which the telegraph or telephone equipment to be protected is housed or in a readily accessible building or shelter from which the wires extend to the office entirely in underground cable. If office arresters are located in such a building or shelter apart from the office building or shelter in which the telegraph or telephone equipment is housed, cable arresters for the protection of that underground cable will be unnecessary.

Instrument fuses or heat coils shall in all cases be located within the office, building or shelter in which the telegraph or telephone equipment to be protected is housed.

The line fuses and cable arresters may be located in a cable box or similar place.

Exceptions

In certain small offices which are not constantly attended and through which important circuits pass, it will be permissible, subject to the approval of the Superintendent of Telegraph or railroad official having jurisdiction, to terminate these line wires directly on approved test-panel jacks or switches in metal cabinets without protectors. In such cases, however, protectors consisting of line fuses, office arresters and instrument fuses or heat coils as covered by the preceding recommendation shall be provided between the test panel or switches and any station instruments used. This will permit the disconnection of the station instruments and protection during periods when the office is unattended as the line wires may then be cut through or opened off at the test panel or switches.

Instrument fuses or heat coils are not required for the protection of office wiring or apparatus in which all current-carrying parts have a conductivity not less than that of No. 16 A. W. G. copper wire; for telephones or similar instruments in outdoor booths or pole and shelter boxes or weatherproof telephones or for common battery telephones.

B. Wires and Apparatus Not Owned by Railroads

All telegraph and telephone wires not owned by railroads which enter railroad buildings, shall, subject to the approval of the Superintendent of Telegraph or official having jurisdiction, be protected in accordance with approved methods *

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*"Approved Types," "Approved Methods" and "Approved Equivalents" shall mean types of apparatus, methods and equivalents approved by the

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Telegraph and Telephone Division, or other Sections or Divisions of the American Railroad Association.

Where the Telegraph and Telephone Division has not yet approved types, materials or methods, it shall be understood in these specifications that types, materials or methods equivalent to those approved by the American Telephone and Telegraph Company, the Postal Telegraph-Cable Company, the Western Union Telegraph Company, or which conform to the requirements of the National Electrical Code and the National Electrical Safety Code covering similar conditions shall be used, subject to the approval of the Superintendent of Telegraph, or other railroad official having jurisdiction. As additional specifications are approved by the Telegraph and Telephone Division, they shall govern.

Companies desiring to have their names added to the list of those whose standard practices are approved should make application to the General Secretary of the American Railroad Association.

Committee No. 6, Message Traffic—Reports on Education Covering Proper Use of Telegraph Facilities

The portion of the report of Committee No. 6, balloted upon for inclusion in the Division's manual, reads as follows:

Education Covering Proper Use of Telegraph Facilities

It is the recommendation that trunk line railroads create the position of Telegraph Traffic Supervisor reporting to the head of the telegraph department, who will, in addition to other duties delegated to him by such department head, act in the capacity of official censor. Such censoring shall be done over the signature of the directing head of the railroad rather than over the signature of the head of the telegraph department. His duties shall be largely along educational lines. Such Traffic Supervisor, in addition to supervising the message traffic and the conduct of the telegraph business of the various offices, will handle such other matters as may be delegated to him from time to time by the head of the telegraph department. The committee recognizes the fact that censoring and brevity is a matter which can only be brought about through education of officials and employees who use the telegraph and telephone. To that end the recommendation of the committee should be addressed to the various directing heads of railroads and sent under personal cover in order to secure the necessary co-operation to bring about results. In referring back to the department heads the telegrams which have been censored, this should be done over the signature of the operating head of the railroad in whose office the files will be kept and to whom the replies must be made. After which they will be referred to the telegraph department for such further action as may be deemed necessary.

The dual position of traffic supervisor and censor shall be held by a man of sound judgment, who must be tactful and thoroughly familiar with telegraph matters, including equipment.

The committee recommends that the Traffic Supervisor in his visits should include a statement of the cost of handling telegraph communications within the large relay or general offices and that such office compile a comparative monthly statement.

It is recommended that all departments be instructed to send copies of all commercial telegrams to the head of the telegraph department daily for his necessary information in connection with the supervision of commercial accounts, contract allowances and also necessary action on the part of the Traffic Supervisor in the event of abuse of the privileges. Without the information gleaned therefrom, the head of the telegraph department is unable to keep in touch with such matters, as contract messages do not reach him for checking purposes for a period of four months and over after transmission. This permits unnecessary and expensive use of commercial service, overrunning of free allowance, etc.

Censorship analysis for educational purposes, along lines of brevity, is considered desirable, referring censored messages back to senders to indicate the number of words that could be eliminated from each message, as well as the number of characters. This for the reason that in routine telegraph practice words containing the smallest number of characters, as well as the minimum number of words, should be used.

The committee recommends a centralized method of car tracing. The practice at present is for the transportation and traffic representatives to promiscuously wire superintendents and yardmasters at various terminals over a designated territory in tracing freight. Ninety per cent. of such telegrams unnecessarily add to the burden of telegraph wires and delay other more important business. Car tracing should be delegated to one bureau on each railroad. Tracers should not be sent except in cases where freight is overdue and only after the regular manifest or passing reports in general use have been consulted in an effort to locate cars. Where it is necessary to trace instead of wiring all terminals en route, as a general thing, cars can be located by simply addressing one message to a particular terminal and further tracing of the car should not be done until the reply has been received from the terminal addressed. Car tracers should not be jointly addressed, requiring duplication of replies. It should either be addressed to the superintendent of the division or the terminal yardmaster. It is recommended that these matters be directed to the personal attention of the operating heads of railroads in order that something more than the mere adoption of this recommendation may be brought about.

It is desirable that on railroads where division and safety meetings are held that the traffic supervisor, telephone inspectors and division linemen be invited to attend the same, presenting an excellent

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opportunity for the telegraph department to place before the rank and file, first, by presenting data at such meetings and, secondly, by the distribution of the minutes thereof, valuable information referring to and affecting the inside and outside units of the telegraph department relative to changes, improvements, safety first and various other matters in which the telegraph department and other departments of the railroads are mutually interested and concerned. It has not been the practice on some railroads to give very much consideration to the telegraph departments at safety or division meetings. The exploiting of thoughts and ideas at such meetings will eventually bring to the telegraph department recognition of its important functions by those who depend upon it in a general way in the matter of railroad operation, the necessity for improvements, economical handling of line and office changes, efficient maintenance, overhead and side clearances, etc., requiring co-operation.

Dominion Telegraph Company's Report

The Dominion Telegraph Company's annual meeting was held at Toronto recently. The balance sheet for the year ended June 30 shows assets of $1,302,316.38, compared with $1,306,329.42 for the previous year, and the liabilities of $1,011,923.30, against $1,013,351.25, the balance of profit and loss account being $290,392.99, a decrease of $585.18 from the previous year. The property is leased to the Western Union Telegraph Company for 99 years from July 1, 1879, the 6 per cent. interest on the capital stock being guaranteed. The directors for the current year are: Sir Henry Pellatt, president; Aemilius Jarvis, vice-president; E. Roper, secretary-treasurer; G. W. E. Atkins, R. C. Clowry, J. Y. Gallagher, Sir James M. Gibson, and D. B. Hanna; the last named replacing Dr. C. O'Reilly, deceased.

New Company Formed

The Ackurate Rubber Company, with offices at 3 Broadway, New York City, has been incorporated in New Jersey to manufacture insulating pipes, compounds and kindred specialties. Willard Candee, president, and Charles V. Ackerman, secretary and treasurer of the company, have been identified with this branch of the electrical industry for over twenty years and are putting their entire effort and experience into the production of high quality products only.

Their Ackerman Friction Tape, now on the market, is put up in paper cartons which are something of a novelty to the trade. They are handling their New York City trade direct and will establish agencies in the principal cities throughout the United States.

In Costa Rica, during February, 1920, the revenue from the National telegraph lines amounted to 7,600 colones (about $13,000).

H. Hulatt, manager of telegraphs, Grand Trunk Railway System, has been appointed consulting manager of telegraphs, western lines, Grand Trunk Railway.

W. M. Post, superintendent of telegraph and signals, Pennsylvania Railroad, Pittsburgh, Pa., announces the appointment of I. E. Keener, acting assistant division operator, as assistant supervisor of telegraph and signals, Central Region, Pittsburgh Terminal Division, with office at Pittsburgh.

Increased Charges for British Inland Telegrams

The minimum charge for the transmission and delivery in the United Kingdom of an inland telegram of 12 words or under, including the address, was increased on September 1, 1920, from 9d. (18 cents) to 1s. (24 cents). The charge for each additional word beyond 12 is 1d. (2 cents). Telegrams handed in on Sunday, Good Friday or Christmas Day will be charged 6d. (12 cents) extra. The charge for a night telegraph letter is 1s. (24 cents) for the first 36 words and 1d. (2 cents) for every 3 words over 36.

The porterage on telegrams delivered outside the free delivery area is increased from 3d. (6 cents) to 6d. (12 cents) a mile or part of a mile. The charge for a reply-paid telegram of 12 words is 2s. (49 cents). The charge for a multiple telegram to two or more addresses in the same town will be calculated at the new rate for the total number of words in the addresses and text, and an additional fee of 4d. (8 cents) for each copy beyond the first. The charges for redirection, retransmission, repetition, and cancellation of telegrams will also be proportionately increased.

The charge for a registered abbreviated telegraph address is £2 ($9.73) a year instead of £1 1s. ($5.11), and the charges for recording instructions for the official redirection of telegrams are 1s. (24 cents) for a period of one week, 2s. 6d. (61 cents) for one month, and £1 1s. ($5.11) for a year.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

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Student's Course in Technical Telegraphy

LESSON No. 13

In previous lessons in this course we dealt with such subjects as: Types of circuits used in telegraphy, Sources of current, Power switchboard connections, and Main line switchboards. Students who have followed the instruction closely know how the current to operate lines is generated; know how generators are connected to instruments and switchboards, and how the various types of switchboard are used.

We are now approaching the most interesting features of telegraph working—the management of circuits, insulation tests, conductivity tests, repeater operation, duplex working, etc.; but inasmuch as practically all main line telegraph circuits are so operated that the earth is used as one-half of each separate circuit, in the present lesson consideration is given to the subject of "The Earth Return."

THE EARTH AS A CONDUCTOR OF ELECTRICITY

It is important that we learn at least as much as is known about the part the earth plays in serving as the return path for each individual telegraph circuit. Due consideration is given to everything that pertains to the other half of the circuit—the wire half—but too few telegraph chief operators have clear ideas as to the phenomena involved in the earth return path. In general the matter is looked upon as a sort of mystery, and allowed to go at that. It remains true, however, that the more we know about earth contact conditions, the better we are prepared to understand the moods and whims of single wire telegraph circuits. For these circuits are not always efficiently workable—the cause, in many instances, being beyond the comprehension of inexperienced circuit chiefs who at the time may be in charge. This merely emphasizes the fact that the more one knows about the circuit "all the way around" the better qualified he will be to deal with difficult cases of disturbance, and of line interruption.

The earth, serving as one-half of a telegraph circuit, may be thought of in two ways—as an immense reservoir of electricity, or as a conductor in the same sense that a copper or iron wire is a conductor.

Should rain fall in torrents over a considerable area, even for a period of two or three days, it is easy to understand that the quantity of water which falls into the ocean does not appreciably affect the level of the water in the sea—at the shore line one might not discover any evidence that the ocean reservoir held any more water than before the rainfall. The rain which fell in the mountains and hills on land during the same period has quite a different experience. First, small pools form, then larger pools, then rivulets which flow into small streams, and these in turn into larger streams—always flowing (falling) to the level of the seas. After the rainfall ceases a considerable period of time will elapse before the water deposited in the hills has

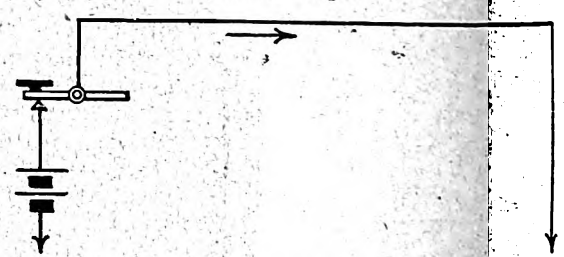

FIG. 29
EARTH RETURN CIRCUIT

reached sea-level, and during this period the flowing water encounters and overcomes the resistance of rocky river-bottoms, sharp bends, etc., before the cycle is complete, and the water again returned to the ocean.

This is a simple analogy which may aid us in understanding the function of the earth as an electrical conductor. In some cases we may regard electricity as entering the earth as into an immense reservoir whose level is not affected; in other cases electricity may enter the earth in such manner that appreciable resistance is presented—as in the case of the water flowing seaward from the hills.

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The function of a lightning arrester connected to a telegraph circuit may help further in the illustration. When telegraph lines are charged with high electric potentials by induction from clouds passing overhead, the induced current in the wire conductor sets about finding a path to earth; a path to a point of lower potential—lower level. Lightning arresters are usually connected to line wires so that lightning discharges have presented to them a path to earth before the high potential currents have reached the telegraph instruments. If the earth connection of the lightning arrester is a good one; that is, of negligible electrical resistance, the lightning discharge will flow harmlessly into the earth and there will be no damage done to apparatus. The earth in this case has acted as a reservoir.

If a poor earth contact has been provided for the arrester, the lightning discharge continues on its way through the wire circuit as a result of which instrument windings may be burned out and fires started. In other words, when the discharge encounters opposition or resistance to its flow to zero level line disturbances and property damage usually follow.

The rain which falls into the ocean encounters no opposition in returning to where it originally started from; but the rain which falls in the mountains encounters a long line of opposition in its efforts to return to sea level. If the current is heavy, bridges and villages in its path may suffer destruction.

The point we are trying to bring out here is that wherever it is desired in telegraph or telephone line operation that paths to earth be provided for lightning discharges, these should as nearly as possible have reservoir capacity. Also, as it is apparent that large capacity earth contacts are essential in smoothly passing along induced currents from charged clouds or other bodies, it follows that when the earth is used as one-half of each telegraph circuit care should be taken to provide ground contacts having minimum electrical resistance.

The resistance between two separated ground plates is dependent upon the character of the soil in the immediate neighborhood of each plate, upon the depth to which the plates are buried in the earth, and upon the size of the plate used. The resistance of dry earth is comparatively high, that of damp earth, low. The best earth contact is that placed in earth which is permanently moist, as by digging deep. All telegraph companies and telegraph departments of railroads have standard methods of making ground connections, and these should be followed closely by linemen and installers.

The use of the earth return in telegraph operation saves many hundreds of thousands of dollars in line wire costs, and although, perhaps, two-wire circuits would operate more satisfactorily during periods of earth current or aurora disturbances, the ground return system is likely always to be standard, and for this reason the importance of first class earth contacts should be kept in view.

When earth current or aurora disturbances are severe two wires are sometimes used in the operation of multiplex printer circuits. The fact that each end of a single wire circuit is grounded, means that at the ground plates currents from other electrical systems may enter telegraph circuits and add to or subtract from the operating currents flowing therein. Also, it is found that between two earth contacts remotely separated a difference of potential may exist permanently, temporarily, or intermittently. Familiarity with the earth current conditions between terminal offices in his district is of material advantage to a wire chief in operating efficiently and continuously the circuits under his charge.

(*To be continued*)

Has It Ever Happened to You?

No telegrapher's education is complete until he has unwound a relay. Two Southern telegraphers recently undertook to do the job. The fine wire was broken close to the core. It was not necessary, they said, to send it to the shop for such a trifle as that. Business was dull that afternoon, and they would have it fixed all right by evening. One held the coil while the other wound the wire, by hand, upon a bobbin. At the end of an hour they had produced a second coil equal in dimensions to the first, without any perceptible diminution of the latter. The shades of evening gathered round. The second coil had doubled its dimensions, while there was a slight apparent decrease in the size of the first. Then they rested, and while one indulged in some emphatic general remarks, the other went and pounded on a key, and abused the operator at G—. If anything will shed balm on the feelings of an exasperated telegrapher it is pounding on a key, and bullying way offices. Next day they rested. The third day they recommenced. By the end of the week they had it unwound. A short debate was held as to whether they should go ahead, and the question was decided in the affirmative. The leisure moments of another day were occupied in rewinding, when one of them made a discovery. In passing through their hands the silk had become frayed and its insulating properties destroyed. They gazed at each other. "Don't you think we had better send it to the shop?" "I think we had better." And it went.

Import License for Telephone and Telegraph Equipment in Venezuela

Secretary J. C. Wiley has cabled from Caracas, Venezuela, under date of September 9, 1920, to the effect that import permits must be obtained for telephone and telegraph equipment and supplies before shipment is made. The requirement is in effect at once.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, and LEWIS MCKISICK, assistant to the president, were in Washington, D. C., September 20, 21 and 22, attending preliminary meetings of the International Communications Conference.

F. E. D'HUMY, central office engineer, accompanied by his wife and two daughters, will spend his vacation at Milford, Pa., the first two weeks in October.

ROBERT E. CHETWOOD, plant engineer, is away from his office on a business trip, to be gone until October 14.

J. S. CALVERT, superintendent, 4th district, Eastern Division, and T. B. KINGSBURY, city superintendent, Philadelphia, Pa., were recent executive office visitors.

T. J. FARRELL, of Superintendent Sawyer's office, has returned from his summer vacation.

W. J. LLOYD, formerly general manager of the Mountain Division, Denver, Colo., was recently elected president of the Preston Oil Co., with headquarters at Denver, Colo.

THE ASSOCIATION OF WESTERN UNION EMPLOYEES held its third annual convention at New Orleans, La., beginning September 17. The headquarters of the convention was at the St. Charles Hotel. About forty delegates were present.

H. W. MOREHOUSE, of the Engineering Department, New York, is at present at Miami, Fla., in connection with the installation of equipment in the new cable station at that point.

R. F. BLANCHARD, chief operator of the Houston, Tex., office, has been appointed acting division traffic supervisor of the Gulf Division, effective October 1.

L. I. FLOWERS has been appointed chief operator of the Houston, Tex., office, effective October 1. Mr. Flowers has been acting as chief operator for some time.

VICTOR R. THORNE has been appointed night chief operator at Akron, Ohio, effective August 22, and effective September 14 John J. Warth was appointed late night chief operator of the same office.

H. A. STOCKDALE, chief operator at Birmingham, Ala., effective August 12, was promoted to chief operator at Charlotte, N. C., vice H. J. Hale, deceased.

GILBERT C. BURNS on October 1 was appointed late night chief operator of the office at Kansas City, Mo.

F. B. POWELL was appointed chief operator at Birmingham, Ala., effective September 12.

L. W. SAUVINET, chief collector at the New Orleans, La., office during the past four years, has been appointed city manager in that city, vice J. C. Jackson, transferred to Dallas, Tex., as manager. Mr. Jackson was at one time employed at St. Paul, Minn.

THE COMPANY has declared a regular quarterly dividend of 1¾ per cent., payable October 15 to stockholders of record September 20.

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New York Western Union

THE WIRE CLUB OF NEW YORK held its regular monthly meeting on September 13.

MISS L. M. PARK, assistant chief operator, Employment Department, 24 Walker St., has recovered from an operation for appendicitis.

J. R. A. WALSH, of the Commercial News Department, has succeeded J. V. Riddick as representative at 24 Walker St., of TELEGRAPH AND TELEPHONE AGE. Mr. Walsh takes charge of new subscriptions and orders for Phillips codes, technical books, etc. Mr. Riddick was recently made manager of the Maritime Exchange office.

C. F. MCMANUS, supervisor of the Telephone Department, Boston, Mass., office, was a New York visitor on September 27.

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Cincinnati, Ohio, Western Union

L. R. SCHOLL, city superintendent, Cincinnati, Ohio, recently acted as host to John Haas, of General Manager A. C. Cronkhite's staff, Chicago, and L. E. Ragsdale, division commercial agent.

GEORGE W. KEITH, JR., of the Cincinnati office, recently received a service message from "up state" which read as follows: "Deliver ours Mabel Smith quick—is well known—is a daughter of Mr. Smith." There may have been but one Mabel in town, but the city directory shows several pages of father Smiths.

THE MEMBERS of the Association Western Union Employees, Detroit, Mich., held a moonlight excursion on the evening of August 13. The lake trip

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was a success and all who attended had an enjoyable time.

Omaha, Neb., Western Union

W. T. Davis, district commercial superintendent, reports the following appointments in the second district, Central Division: F. C. Siddall, formerly district commercial manager, advanced to the managership of the office at Sioux City, Ia., vice J. P. O'Donnell, retired; M. J. Grady, formerly chief clerk to Superintendent C. B. Horton, New York, made district commercial manager, vice Mr. Siddall; W. M. Fallon, formerly manager at Dubuque, Ia., advanced to the managership of the Waterloo, Ia., office, vice E. A. Gregory, furloughed; P. H. Pauli, formerly in the traffic department, Washington, D. C., appointed manager at Dubuque, Ia.; J. H. Mack, from Fort Dodge, appointed manager at Grand Island, Neb., vice S. S. Frank, furloughed, and W. B. Rush, appointed manager at Fort Dodge, Ia.

Increase in Press Rates

New schedules for press messages bearing advances of approximately 20 to 30 per cent. became effective September 1.

The new charges are as follows:

Night press messages: One-sixth of what the tolls would be on the same message at full commercial day rates, commercial count.

Day press messages: One-third of what tolls would be on the same message at full commercial day rates, commercial count.

Tolls will be figured at full commercial day rates and divided by six or three, for night and day messages, respectively.

The announcement says that press rates will apply to special dispatches in plain English language addressed to newspapers or press associations, filed by their authorized correspondents, to be paid for by such newspapers or press associations and containing bona fide reading matter for publication; also to similar matter filed by bona fide press associations addressed to newspapers or by one newspaper to another, and paid for by the sending press association or newspaper.

Telegraph and Telephone Life Insurance Ass'n

N. M. Griffin, secretary of the Telegraph and Telephone Life Insurance Association, is sending out to all members a copy of the constitution incorporated in which are the new regulations covering dues, etc. Old-time members who do not transfer to the new proposed third division will remain as at present, but their insurance cost will increase to about $36 per annum. This determination will be made as soon as it is known how many intend to transfer to the new grade.

POSTAL TELEGRAPH-CABLE COMPANY

Edward Reynolds, general manager, and F. J. Kernan, auditor, spent a day at the Albany, N. Y., office recently.

C. A. Comstock, assistant to the general manager, has returned from a western trip which included stops at Chicago, Cleveland, Detroit, Kansas City, and other large cities.

W. C. Daviet, assistant to the general manager, is on an inspection trip to points in the middle western and southern states.

Recent Visitors at the executive offices included Mr. and Mrs. H. H. Mull, of Charleston, W. Va., and Miss Pollard, cashier of the Richmond, Va., office.

Harold Casserly, chief clerk to the general manager, has returned from a two weeks' vacation.

The Company's Office at Macon, Ga., was recently moved into new and larger quarters. F. B. Gabriel is manager at Macon.

Warren S. Hallett, superintendent of supplies, attended the funeral of his stepfather, D. F. Lewis, who died at Provincetown, Mass., on September 9. At the time of his death Mr. Lewis was eighty-six years of age.

E. E. Butler, of Indianapolis, Ind., has been appointed manager at Louisville, Ky., vice L. W. Janes, resigned to accept the position of wire chief with the Louisville and Nashville Railroad. Mr. Butler, during the late war, was a member of the 309th Field Signal Battalion, Eighty-fourth Division, and saw active service overseas.

Nat Krause, of the Denver, Colo, office, accompanied by Mrs. Krause, was a recent New York visitor. Mr. Krause is on a three months' furlough, and will visit various cities in the east before returning west.

Managers Appointed: David Adams, Greenville, N. C.; G. L. Townsend, Greenville, S. C.; H. Siegfried, Steubenville, Ohio; C. B. Adams, Newport, Tenn.; J. D. Thigpen, Millen, Ga.; J. Andrews, Lawrence, Mass.; N. Silverman, Concord, N. H.; Miss C. Lillie, Hastings, Mich.; G. Gory, Pontiac, Mich.; L. E. Watson, Cadillac, Mich.; A. A. Blaschek, Warren, Ohio; Mrs. M. E. Seifert, Mason City, Iowa; Corinne Piersall, Rome, N. Y.; F. N. Vanmarter, Kingman, Ariz.; M. S. Smith, Greeley, Colo., and Ben Zeman, New Bedford, Mass.

New York City Postal

John F. McNeill, manager of the office at Fifth Avenue and 42nd Street, recently underwent an operation at St. Francis Hospital. He is rapidly regaining his health and expects to be able to return to duty in the near future.

The Recent Explosion in Wall Street entirely destroyed a large plate glass window in the

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Broad St. side of the office at No. 20 Broad—the cable office. This is an indication of the close call the staff had at the time of the disaster. Fortunately none of the employees was injured.

Buffalo, N. Y., Postal

ALBERT BURGER, expert telegrapher on the first New York bonus circuit, handled a record number of telegrams one day during the week of September 19. At a time when traffic conditions were unusual Mr. Burger was in prime condition, so continued through a double trick, handling 1,300 messages.

LLOYD LOVE, of the first Syracuse, N. Y., bonus circuit, has purchased an automobile, which he says is the "Man O'War" of the auto world.

CORRINE PIERSALL, operator in the Rome, N. Y., office, has been advanced to the position of manager of that office. Alton B. Parker, formerly manager of the summer office at Alexandria Bay, N. Y., succeeds Miss Piersall as operator at Rome.

Boston, Mass., Postal

FRANK H. JENNINGS, general traffic chief, is camping at Dublin, N. H., while on his summer vacation. P. J. Burke, quad chief, is spending a two weeks' vacation at Lewiston, Maine.

D. J. LANGLOIS, of the Quadruplex Department, has returned to duty after a two weeks' tour through the mountains.

MISS F. FERRELL, of this office, has been transferred to a position in the New York Main office.

W. C. UPHAM, for some time manager of the office at North Adams, Mass., has returned to duty in the Boston main office.

THE BASEBALL TEAM composed of Postal employees had a very successful season. Plans are underway to organize a basketball team for the purpose of keeping the athletes in good condition during the winter months.

Chicago, Ill., Postal

C. A. COMSTOCK, assistant to the general manager, is on an official trip to Western Division offices, which will include stops at Chicago, Ill., Peoria, Ill., Davenport, Ia., and Des Moines, Ia.

J. G. WOLF, manager at Omaha, Neb., visited Chicago headquarters recently while on his way to Indiana on vacation.

A. L. BALASSA, chief clerk to General Superintendent E. W. Collins, is at Bluff Lake, Ill., on a short vacation.

HILDA PEARSON, stenographer in the general office, is away on her summer vacation.

MISS ROBERTS, of the Rockford, Ill., office, spent her vacation visiting the home of her father in Robertsville, W. Va. The town was named after her grandfather.

MISS E. H. PLOUFF, of the Menominee office, is spending her vacation with friends in Minneapolis, Minn.

J. E. PARKE, manager at Keokuk, Ia., has been transferred to the Davenport, Ia., office.

JOSEPH OWENS, of the Burlington, Ia., office, has been appointed manager at Keokuk, Ia.

MISS RAINIER, manager at Kearney, Neb., is absent on vacation and is relieved by Lamira Cox, of Schuyler, Neb.

GEORGE ANDERSON is relieving Miss Barnes, manager at Hastings, Neb., while the latter is on vacation.

C. L. PREFONTAINE, formerly manager at Fond du Lac, Wis., is relieving Manager Hawkins at Terre Haute, Ind., during the latter's vacation.

Seattle, Wash., Postal

F. E. DE PARCQ has been appointed all night chief operator at Portland, Ore., vice L. G. Auld, who has gone to California with a view to improving his health.

CLIFFORD D. CLARKE has been appointed chief operator at Seattle, vice Ralph W. Banks, transferred to Spokane, Wash., at his request.

A. B. RICHARDS, general superintendent Pacific Division, San Francisco, accompanied by H. E. Patton, superintendent, Seattle, recently visited offices in Montana, Washington and Oregon.

NEW CABINS are being built for linemen's shelter during the winter months at Sunset Highway and Meadow Creek, Wash. Lineman N. B. Mayo, of Easton, Wash., is in charge of the work. During the winter months the trouble hunters navigate on skiis and snowshoes on account of the heavy deposits of snow over the mountain routes.

C. H. KESSLER, operator, now works the Portland-San Francisco bonus circuit, at Portland.

AT SALEM, OREGON, Eugene Kennedy, messenger, has gained an enviable reputation as a speedy deliverer of telegrams, and when a call comes in for a messenger, Gene reports at the customer's office so quickly that the message to be sent is seldom ready for him when he arrives. Recently a customer asked the boy what kind of an airplane he uses, and Gene explained that when one gets a bicycle going at thirty miles an hour it will take to the air on the mud guards.

IRVING RICE, who has had considerable commercial telegraph experience, is now acting as relief operator at points in Connecticut.

ORVAL SHAW, a TELEGRAPH AND TELEPHONE AGE subscriber living at Saskatoon, Canada, has the right idea when he says: "The best way for a man to keep posted about what is taking place in his chosen profession is to read regularly the trade paper covering the subject."

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SUBMARINE CABLE ITEMS

THE 37TH STREET, NEW YORK OFFICE, of the Commercial Cable Company has been moved from No. 4, West, to No. 66 West 37th St., near Fifth Avenue.

ARTHUR DEARLOVE, cable engineer, who has been in New York for some time, returned to England on the *Olympic,* which left New York on September 18.

GUY H. RIDGE, of the traffic manager's office, Western Union Cable System, New York, has gone to the Bay Roberts, Newfoundland, station on company business.

W. J. MCAVOY, who has been at the North Sydney, N. S., cable station of the Western Union Company, is in New York, and expects to start for the Miami, Fla., cable station shortly.

THE COMMERCIAL CABLE COMPANY announces that the Jamaica-Porto Rico cable has been repaired, restoring communication with the West Indies and the Virgin Islands.

American Cable For the Philippines

The Habirshaw Electric Cable Company, Yonkers, N. Y., has recently made delivery to the United States government of 100 miles of submarine cable for use in the Philippines. The cable is made in two continuous lengths of 50 miles each and weighs 425,000 lbs. It consists of a single stranded No. 12 A. W. G. conductor, tinned, 40% rubber insulation and protected with galvanized steel armor wire cushioned with a layer of asphalted jute between the rubber insulation and the armor and provided with an outside covering of asphalted jute. The interesting features of this cable are the long lengths in which it was made and the great weights involved.

Money Transfer Frauds

H. W. Ladd, general auditor of the Western Union Telegraph Company, New York, reports the apprehension and arrest of an imposter who thought he could make a living by working the money transfer swindle. Recently a party named T. M. Tricker, using the name of W. E. Hargrove, of Waco, Tex., telegraphed Mrs. Hargrove from Houston, Tex., to wire fifty dollars by Western Union. The money was telegraphed and paid before discovery was made that the real Mr. Hargrove had not asked for a remittance. This might have been the end of the story, except for the fact that the dead beat's philosophy is to keep on working what appears to be an easy thing. In this instance the imposter tried it again and got caught. During the next seven years he will be engaged in the State penitentiary paying for his bed and board by reducing rocks to a size just right for roadways.

Spanish Government to Purchase Telegraph and Telephone Material

The Spanish Direction General of Post and Telegraph is now established in the new building known as the Palacio de Comunicaciones de Madrid, but all of its equipment for telegraph, telephone, and wireless services has not been installed. To call for sealed proposals for the material needed, which may be supplied either by domestic or foreign producers, would retard the completion of the work, and there is an urgent demand for getting the system promptly into working order.

Accordingly, a royal decree published on August 4 authorizes the Spanish Ministro de la Gobernacion to purchase, on behalf of the Direction General of Post and Telegraph, without the usual formality of bids or competition, telegraph and telephone material for lines and stations for use in the transmission service of the palace of communications; for its lighting and motor force; for the installation of 100 radio telegraph and radio telephone stations to be established in Peninsular Spain, the Balearic Islands, and North Africa; and for equipping the central station for the service of these means of communications. A sum of 2,838,866 pesetas is appropriated for the necessary outlay.

This information is forwarded by Consul-General Carlton Bailey Hurst, at Barcelona, Spain.

New Book on Radio

Frank E. Summers, of Memphis, Mo., has published a book entitled "Revolutionary Theories in Wireless," which contains 174 pages and 74 illustrations. The work is an exposition of Mr. Summers' theories and ideas relative to the principles underlying radio signaling. The price is $2.50 per copy, from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"
By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

IN CUBA, during the month of May, 1920, the receipts of the Department of Communications amounted to $225,932. The telegraph section earned $89,198 of this, the remainder being postal receipts.

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DR. CHARLES HOLT THOMAS, of Cambridge, Mass., died at that place on September 4, of heart disease. In his youth Dr. Thomas was telegrapher at the Duxbury, Mass., cable station, later working as an operator for the Associated Press. Dr. Thomas was seventy years of age at the time of his death.

JOHN C. WATTS, of Vincennes, Ind., a member of the United States Military Telegraph Corps, died on September 2, at Vincennes.

GEORGE W. SHEIBLER, aged seventy-four years, died in Brooklyn, N. Y., on September 12. Mr. Sheibler was telegraph receiving clerk in the Willard Hotel, Washington, D. C., during the Civil War. In later life he became a successful silversmith, during the past ten years being connected with Gorham & Co., New York.

EVERY TELEGRAPH OPERATOR
Will Want a copy of This New Book

The book of telegraph penmanship containing prizewinning specimens submitted in contests recently participated in by railroad and commercial telegraphers.

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In handsome library binding, containing eighty pages of text and fac-simile zinc etchings illustrating the penmanship of some of the most artistic teelgraph penmen in the country.
In addition to samples of the penmanship of famous old-timers, the book contains the twenty-four winning specimens submitted in the 1918 Telegraph Penmanship Contest conducted by the Railroad Man's Magazine.

THE PRICE IS $1.15 PER COPY

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Ownership Statement

Statement of the ownership, management, circulation, etc., required by the Act of Congress, of August 24, 1912, of TELEGRAPH AND TELEPHONE AGE, published 1st and 16th days of each month at New York, N. Y., for October 1, 1920.

State of New York,
County of New York,
ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared John B. Taltavall, who, having been duly sworn according to law, deposes and says that he is the publisher of THE TELEGRAPH AND TELEPHONE AGE and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, John B. Taltavall, 253 Broadway, New York.
Editor, Donald McNicol, 253 Broadway, New York.
Managing Editor, none.
Business Managers, none.

2. That the owner is:
John B. Taltavall, 253 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities, are:
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

JOHN B. TALTAVALL, Publisher.

Sworn to and subscribed before me this 23rd day of September, 1920.
[SEAL] JOSEPH R. FRITH.

(My commission expires March 30, 1922).

Notary Public, Kings County, No. 79.
Certificate filed in New York County, No. 182.
Kings County Register's No. 2078.
New York County Register's No. 2163.

An Old-Timer Says

Watching a repeater is always a thankless task. I remember a telegrapher who was noted for his ability to endure a great deal of rest. On one occasion he was put to watching a repeater, and was highly elated over his "soft job." At the end of two hours he was begging for relief. Some repeaters are notorious. Among them was one at Memphis. At a time when the yellow fever prevailed at New Orleans, the operator at the latter place jocularly asked the one at Cincinnati if he was not afraid of contracting the disease by working that wire. "Not at all," was the ready response, "it can never get through that Memphis repeater."

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Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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o. 20 NEW YORK, OCTOBER 16, 1920 Thirty-eighth Year

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EDITORIAL COMMENT

Scarcity of Technical Writers

The editor of TELEGRAPH AND TELEPHONE AGE recently was called upon to find three technical writers familiar with the subjects of telegraphy, telephony and radio, for service with large corporations, and his experience while searching for qualified applicants revealed a situation which is worth review.

There are several engineers in the service of the telegraph companies who are thoroughly familiar with the subjects here concerned, and who are good writers, but these men already occupy official, or semi-official positions and are satisfactorily located. These men are, in the main, middle-aged—in their prime—and learned to write because of personal bent and individual effort. There has been little encouragement along this line held out to the younger men, and practically no organized schooling. The situation is important and worthy of serious attention.

In Great Britain there are perhaps ten writers on the general subject of electric communication to one in the United States, and the extent of the business in the two countries is about of the inverse ratio. Analysis of the probable causes of this situation discloses various contributing factors, chief among which has been the lack of inducement offered the younger men engaged in the business to describe in writing what they have observed, what they have learned, and what they think about the apparatus and systems worked with from day to day. In Great Britain the technical societies appear to have success in drawing a large proportion of the operating experts into membership. This presents to the men opportunity for association with other bright minds engaged in investigation and research, the natural result being that the younger men gain respect for the ability of those who do the big things, and are inspired to follow in the steps of others who have gained advanced professional standing by writing technical papers. Abroad, there are various schemes of awarding medals and diplomas to the writers of papers above the average in constructive value. In the United States and in Canada for many years there has been a feeling on the part of many that instead of there being accruing advantages, the writing of articles having to do with the work in which they are engaged in reality brought censure from official superiors, and from associates expressions savoring more of burlesqued sympathy than of anything else. Too many men have had experiences of this sort for there to exist doubt as to the extent of the retrograde conditions.

Experientialism is based on the theory that all knowledge comes from experience, and while it is true that a person who knows how properly to study a textbook may know more about a device or a system than many of those actually handling the device or the system, it remains true that almost any man who has had a number of years experience with a certain type of apparatus should be able to write instructively about what he has observed—about things which, in many instances, have escaped the notice of others.

When we speak of encouragement, the question: "Where should the encouragement come from?" presents itself, and it is plain that for a time encouragement to be fruitful should take the form of inducement, and that the award, or the compensation, should come from one or all of three sources: the employer, technical societies, the technical press.

The field is wide and promising for the fellow who will on his own initiative go ahead without waiting for outside encouragement, but it is high time that something be done in an organized way to increase the number of writers who can deal intelligently and instructively with the various angles of electric communication.

Delegates to the International Communications Conference at Washington

The French delegates to the International Communications Conference have arrived in this country. They are: M. Lanel, minister plenipotentiary, and M. de Lapradelle, representing the French foreign office; M. Broin and M. Poulaine, representing the post, telegraph and telephone department; General Ferrie, representing the war department; Lieut. de Veisseau Robin, representing the navy department, and Captain Franck, representing the air service. Delegates from Japan and Italy also have arrived in Washington.

At the first meeting of the Conference, held on October 8, Ambassador Shidehara, of Japan, chairman of the Japanese delegates, made a motion that Norman H. Davis, Under Secretary of State, be made president of the preliminary conference. The motion was voted upon favorably. M. Lanel, of the French delegation was made vice-president.

It was decided that the Conference should function mainly through committees, with only occasional general meetings. Committees were appointed to consider disposition of the German cables utilized by the Allies during the war and since; the radio protocol drawn up by France, Great Britain, Italy and the United States in 1919; drawing up of a "Universal communications union" embracing radio and telegraph; formulation of a code of international radio and cable law to embrace cable landing rights; plans for the promotion of communication facilities between Allied and Associated Powers.

The various committees began holding sessions on Monday, October 11.

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Telegraph and Telephone Superintendents Meet at Winnipeg.

Convention of Telegraph and Telephone Section.

American Railway Association.

Section One, Operating, American Railway Association, known as the Telegraph and Telephone Section, held its annual convention in Winnipeg, Man., on September 22, 23 and 24.

Chairman J. F. Caskey presided, and at certain sessions the meeting was addressed by Mayor Gray, of Winnipeg; A. E. Stevens, general superintendent of the Canadian Pacific Railway, and W. E. Duperow, general passenger agent of the Canadian National Railways.

At the sessions held on September 22 were presented the report of the Committee of Direction; report of Sub-Committee A—Construction and Maintenance of Pole Lines, E. C. Keenan, chairman, and Sub-Committee B—Wire Crossings, H. A. Shepard, chairman. These reports were explained by the chairmen and discussed by the members present.

On September 23, Committee No. 2—Construction and Maintenance, Inside Plant, R. F. Finley, chairman, presented specifications governing the installation of communication equipment in railroad offices; Committee No. 4, Protection Against Lightning or Electric Light and Power Circuits, I. C. Forshee, chairman, presented its report of work done during the past year; also Committee No. 5, Telegraph and Telephone Development, J. A. Jones, chairman; Committee No. 6, Message Traffic, H. Hulatt, chairman, and Committee No. 7, Inductive Interference, E. L. King, chairman.

Several of these reports are covered in this issue, and in the October 1 issue of TELEGRAPH AND TELEPHONE AGE.

ELECTION OF OFFICERS

The election of officers of the Division resulted in H. Hulatt, manager of telegraphs, Grand Trunk and Grand Trunk Pacific Railroads, being elected chairman; W. H. Hall, superintendent of telegraph, Missouri, Kansas and Texas System, first vice-chairman, and E. L. King, superintendent of telegraph, Southern Pacific Railroad, second vice-chairman. The following six members were elected to serve on the Committee of Direction for the coming year: E. E. Dildine, superintendent of telegraph, Northern Pacific Railroad; George D. Hood, superintendent of telegraph, Chicago, Rock Island and Pacific Railroad; J. McMillan, manager of telegraphs, Canadian Pacific Railroad; C. S. Rhoads, superintendent of telegraph, C., C., C. & St. L. Railroad; George A. Cellar, general superintendent of telegraph, Pennsylvania System, and E. A. Chenery, superintendent of telegraph, Missouri Pacific Railroad.

Members of the Committee on Nominations elected are: H. C. Chace, superintendent of telegraph, Santa Fe Railroad; P. F. Frenzer, superintendent of telegraph, Union Pacific Railroad; J. A. Jones, superintendent of telegraph, Southern Railroad; J. McMillan, Canadian Pacific Railroad, and J. C. Rankine, superintendent of telegraph, Great Northern Railroad.

NEW COMMITTEES NAMED

At a meeting of the Committee of Direction held on September 25, three new committees were appointed: Telephone Transmission, Stanley Rhoads, chairman; Technical Training, I. C. Forshee, chairman, and Radio and Wired Wireless, J. D. Jones, chairman. Also the name of the Committee on Future Activities was changed to "Committee on Future Activities and Topics," with W. H. Hall, second vice-chairman of the Division, as chairman, the other members of this committee to be the chairmen of all of the technical committees. The duties of this committee are to consider subjects for future consideration by the various technical committees of the Division and to arrange for one or more papers to be given by prominent experts on live topics at Division meetings and to arrange for thorough discussion in connection therewith.

Chairman Hulatt has increased the personnel of the various committees to include about twenty-five additional men, so that a larger number of members will have opportunity to do constructive work.

FUTURE MEETINGS OF THE SECTION

The next meeting of the Section will be held in Atlanta, Ga., in March, 1921, and the September, 1921, meeting will be held in Cleveland, Ohio.

TELEGRAPH AND TELEPHONE APPLIANCE ASSOCIATION

The Telegraph and Telephone Appliance Association held its annual meeting at Winnipeg on September 23. The election of officers for the ensuing year resulted as follows: W. T. Kyle, chairman; J. Warren Young, vice-chairman, and G. A. Nelson, secretary and treasurer. The members of the executive committee are: B. A. Kaiser, E. E. Hudson, A. D. Smith, Wallace L. Cook, G. K. Heyer and F. W. Bayles.

CONVENTION NOTES

For the members who journeyed to Winnipeg by way of St. Paul, Minn., the Telegraph and Telephone Appliance Association arranged a luncheon

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at the St. Paul Hotel at 1 p. m., Monday, September 20, after which there was a sight-seeing trip around the city. On Monday evening about thirty of the superintendents left St. Paul on the Great Northern Railroad. On the train a pretty surprise awaited the travelers, when each man found in his seat an individual bouquet of flowers with card attached bearing his name. The offering was from the telephone operators of the Great Northern Railroad. Also, window cards were provided for the special cars, each card ornamented with the system symbol of a given railroad. On this train one car was assigned to the superintendents accompanied by their wives, while another car was assigned to the single gentlemen.

H. HULATT

Chairman, Telegraph and Telephone Section, American Railway Association

On Tuesday evening, September 21, a get-together meeting was held at the Fort Garry Hotel, Winnipeg. At this meeting Barney Kaiser, the Generalissimo of the Telegraph and Telephone Appliance Association, organized what will likely be known to telegraph history as the "Ash-Barrel" Quintette. A quick try-out of the singing voices of those who had already arrived at the headquarters, followed by elimination tests, resulted in Messrs. Cellar, Chenery, Keenan, Hall and H. Hulatt gaining the coveted places to windward of the hotel piano. The songs were well rendered and brought forth genuine applause from the audience.

Several of the railroad men had been in Winnipeg on previous occasions and knew that the hotel was just across the street from the railroad depot. Others who knew nothing about the city, elected to take a chance in merely following the crowd, but General Superintendent G. A. Cellar of the Pennsylvania System engaged a taxicab for the trip, and invited Mr. Chenery to share his accommodations. No taxi driver ever was known to decline a fare, and in this instance Messrs. Cellar and Chenery were conveyed across the street in comfort.

ENTERTAINMENT

At the banquet given in the Ballroom of the Fort Garry Hotel on the evening of September 23, 215 members and guests were present. At the head table were seated Sir James A. M. Aikens, lieutenant-governor of the Province of Manitoba; Mayor Gray, of Winnipeg; H. H. Hansard, solicitor and director of the Grand Trunk Pacific Railroad; George D. Perry, general manager of the Great North Western Telegraph Company; J. F. Caskey, chairman of the Telegraph and Telephone Division, American Railroad Association; E. A. Chenery, toastmaster; George A. Cellar, H. Hulatt, E. P. Griffith, W. H. Hall, E. C. Keenan and William Bennett.

J. F. CASKEY

Retiring Chairman, Telegraph and Telephone Section, American Railway Association

The address delivered by Sir James Aikens dealt with the necessity for cordial relations between the United States and Great Britain, with special reference to the Dominion of Canada. Sir James is known as one of the best posted and most fluent orators in Canada, and on this occasion his address was received by the railroad men with close attention and with great applause. Mayor Gray, of Winnipeg, delivered an interesting speech on the Resources of Western Canada, and to many of those present it was a revelation to learn of the vast possibilities for future development existing in Manitoba and the other North Western Provinces.

Mr. Hansard, of the Grand Trunk Pacific Rail-

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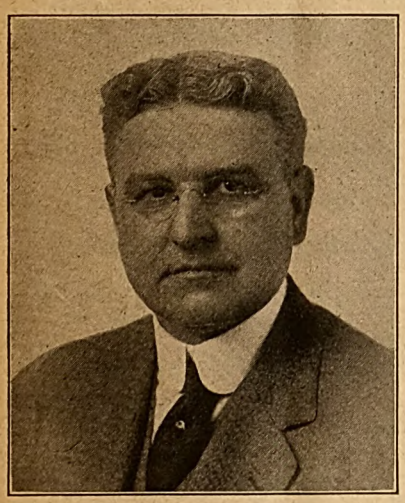
oad, spoke about the advantages of cordial rela-ions between the United States and Canada, and pon the benefits which invariably result when men ngaged in one line of work organize for the tech-ical advance and improvement of the means of ommerce and transportation. As a toast, Mr. Iansard proposed the health of the Telegraph and elephone Division, American Railroad Association.

W. H. Hall
First Vice-President, Telegraph and Telephone Section, American Railway Association

In the other timely speeches delivered, Mr. Wil-iam Bennett, of the Chicago and Northwestern Railroad, proposed the health of His Majesty the King; Mr. H. Hulatt, the new chairman of the Division, proposed the health of the President of he United States; Mr. E. C. Keenan, of the New York Central Lines, proposed the health of the guests present; Mr. G. A. Cellar, of the Pennsyl-vania Lines, the health of the ladies, and Mr. W.



E. C. Keenan
General Superintendent of Telegraph
New York Central Railroad

H. Hall, of the Missouri, Kansas and Texas Sys-em, the health of the members of the Telegraph nd Telephone Appliance Association.

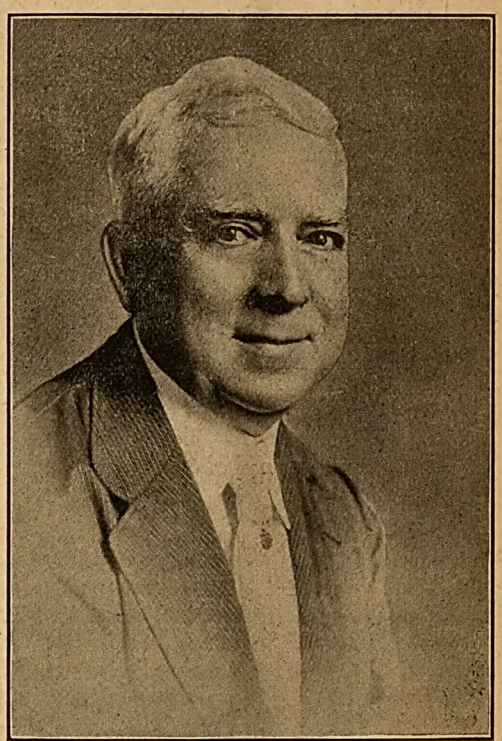
Edison Telegraph Record Reproduced

During the proceedings, Mr. E. P. Griffith, of the Erie Railroad, gave an account of the history of the indestructible phonograph record which bears an impression of the Morse telegraph sending of the famous ex-telegrapher and inventor, Thomas A. Edison. The record was then placed upon the tray of a phonograph and as the machine was started all those present heard the clear Morse signals sounding out the message:

To the Telegraph Fraternity:

Amid the activities of a busy life full of expectations, hopes and fears, my thoughts of early association with my comrades of the dots and dashes have ever been a delight and pleasure to me. I consider it a great pleasure to record in Morse characters on an indestructible disc this tribute to my beginnings in electricity through the telegraph, and with it a God-speed to the fraternity throughout the world.

"73" Edison.



George A. Cellar
General Superintendent of Telegraph
Pennsylvania Railroad

At the end of this ceremony, by unanimous vote of the members, the record was presented to J. F. Caskey, retiring chairman of the Telegraph and Telephone Division.

Toastmaster E. A. Chenery carried through in a highly satisfactory manner the difficult post assigned him. His numerous brief speeches of introduction disclosed an uncanny—almost a supernatural familiarity with the idiosyncrasies, the foibles, and also the worthy endowments, of the telegraph superintendents who addressed the members and guests. At one point Mr. Chenery ruled a point of order and requested Mr. H. Hulatt to stand up in view of all present so that references to be made to

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him might not fall elsewhere. The charge was that the date—September 23—was, in fact, the ninth anniversary of Mr. Hulatt's wedding day, and that, so far as Mrs. Hulatt knew, the matter was a total void in her spouse's mind. Mr. Hulatt was noticeably and deservedly perturbed, especially so as in the faces of the ladies before him was mirrored an unmistakable depreciation in his exchange rate. However, by specious argument Mr. Hulatt extricated himself, laying the blame upon the vast amount of work he had performed in planning for the Winnipeg meeting. Mrs. Hulatt's consolation came to her in the form of a beautiful silver cakedish, which was presented by the members of the Division.

J. A. Jones
Superintendent of Telegraph
Southern Railroad

Musical Entertainment

The musical numbers at the banquet included songs by Miss Margaret Smith, daughter of Superintendent F. W. Smith, and Mrs. Eric Hulatt. A sextette, consisting of Mrs. Cellar, Miss Smith, Mrs. Hall, Mrs. McCuary, Mrs. Chenery and Mrs. Eric Hulatt rendered several excellent selections, which were enthusiastically received. Captain Eric Hulatt was the accompanist for the singers. Also, the Ash-Barrel Quintette, which had done valiant service at the get-together meeting on the evening of September 21, again performed creditably.

General Superintendent Keenan's long advocacy of substantial pole line construction prompted the quartette to sing the following verse, which was rendered to the tune of "Just A-Wearying for You."

"Pole lines thrill 'Ed' through and through,
Idol of his heart they prove,
If they don't get past us now,
He'll be coming back again:
How he wants them to go through—
Keenan's just a-wearying for you."

The ladies of the convention presented Mrs. B. A. Kaiser with a handsome boquet of flowers and a gift of value for her home.

Afternoon Entertainment for the Ladies

While the business sessions of the convention were under way, the ladies who accompanied their husbands to the convention were entertained by the Telegraph and Telephone Appliance Association.

On the afternoon of the 22nd a visit was made to the large retail store of T. Eaton and Company, where the ladies were shown through the various departments by special guides. On the afternoon

B. A. Kaiser
American Telephone and Telegraph Co.
New York

of the 23rd the ladies visited the Royal Alexandra Hotel, where they were shown the Royal suite. An automobile tour around the city was then participated in by many of the ladies, which included an inspection of the provincial parliament buildings.

On the evening of September 22, a theatre party was given to the entire delegation, or as many as had no other engagements.

On Friday afternoon, September 24, the ladies were shown through the kitchen, supply rooms and pantries of the Fort Garry Hotel.

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Telegraph and Telephone Development

At the Winnipeg, Man., convention of the Telegraph and Telephone Division, American Railroad Association, held September 22, 23 and 24, the report submitted by Committee No. 5—Telegraph and Telephone Development, read as follows:

Sending Machines

In order to obtain information in regard to the relation between the length of time intervals of the dot and space signals sent on a wire by sending machines, the Cleveland, Cincinnati, Chicago & St. Louis Railway tested 13 sending machines which were in daily service in the Indianapolis telegraph office. The machines were taken out of service and tested without further adjustment, thus recording their actual condition. Oscillagrams were taken at three places in the circuit when the machines were working on a duplex wire. The curves show, (1) the current actually going to the line, (2) the current going from the transmitter to the 5-U coil, and, (3) the current in the key circuit.

From a study of the traces of these oscillagrams, it is evident that the dots are shorter than the spaces. If the outgoing dots are short, the received dot at the distant station will be short, and due to the nature of the polar relay, it is difficult to lengthen a light dot by adjustment at the receiving station. The adjustment must be made at the sending station. This may be accomplished by providing a sounder circuit which will make lighter dots than are now made for a given length of dot. With a heavier adjustment on the sending machine dots of proper length for the sounder circuit will be produced and a longer dot will be received at the distant station. The experiments indicate that the machines are not making too many dots for the class of circuit on which they are worked, but that the trouble is more in the length of the dot than the speed and number of dots per second.

Welding Iron Wire Joints

In order to reduce and stabilize the resistance for telegraphic purposes and to balance the transmission for telephonic usage, experiments have been made to determine the mechanical and electrical effects and the cost of welding iron wire joints. The mechanical and electrical efficiency of joints in corroded iron wire may in some instance be increased over 100 per cent. by electric or gas welding.

The Hocking Valley Railroad removed 250 ohms from each of two telephone circuits and the Zanesville and Western Railroad removed 500 ohms from a telephone circuit by welding iron wire joints with an oxyacetylene flame. Experiments by the Bureau of Standards indicate that the tensile strength of the unwelded iron wire joint made in the usual way is 50 per cent. of the unspliced wire and that the welded joint is 9 per cent. stronger than the unspliced wire. The resistance of a welded joint is 95 per cent. of that of an unspliced wire, while the resistance of the usual soldered joint is 112 per cent. of the unspliced wire. The resistance of an unsoldered joint was found to be about 200 times as great as the same length of unspliced wire.

Two ends of the wire on either side of the existing joint are drawn together and clamped with sufficient slack to insure against strain on the joint during the welding. The weld is made by heating the neck of the joint to a fusing heat with a welding torch, using a No. 2 tip, and then flowing a small quantity of welding wire to increase the diameter of the wire about 1-16 in. The torch should be used to burn off any galvanizing that may remain on the wire. No. 9 ungalvanized scrap iron wire should be used for welding No. 8 iron wire. After the weld is made it is advisable to paint the joint with red lead to prevent corrosion.

This work was performed with an oxyacetylene flame at a cost varying from 26 to 40½ cents per joint. Gasoline or kerosene driven electric generating outfits of .6 or .8 K.W. capacity can be used for welding. The cost is not excessive, and the work, when completed, is of a permanent nature.

Emergency Lamp

The Toledo and Ohio Central R. R. has developed a gas lamp to be used by maintainers when working at night. A Ford gas headlight is equipped with a special carrying handle and supporting base, welded into one frame. A motor cycle size acetylene tank is connected with a small hose to supply gas. This lamp can be used on the front of motor cars, on the poles when the maintainer is working, for locating crosses, and clearing away debris around pole lines in cases of wrecks. The total weight is 18 lbs. and parts can be assembled for $14.00. The lamp will burn continuously at full flame for 24 hours on one charge of gas at 50 cents. These tanks can be recharged at supply houses or at any automobile service station.

Portable Dry Battery Lamp

The New York Central Lines have designed a portable dry battery hand lamp for use in running motor cars and clearing trouble at night. A company has begun to manufacture the lamps.

A 20-candle power and a 2-candle power 6-volt light are mounted in a Buick type automobile headlight. A Ford red tail-light is provided on the back of the lamp and 3 switches of the automobile dashboard control type, each switch controlling one light, is associated with the lights. Five No. 6 dry cells supply the current and the entire outfit weighs about 20 pounds.

Tests indicate that the 20-candle power light will give a satisfactory light for two or three hours and the 2-candle power light for a considerable length of time. A curved handle allows the light to be carried conveniently at an angle so that the light can be thrown upward. The 2-candle power light can be used on the motor car when running

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and the 20-candle power light for the short period required in clearing trouble.

Motor Generator Bench

Motor-generator benches for train and message circuit motor-generators have been standardized by the New York Central Lines. The specifications provide benches of capacity from 2 to 12 motor generators. The bench is of double-deck style and all control apparatus is closely associated with the machines. Test panel units are provided on the end of the bench and so wired that generators can be used interchangeably on any circuit.

A similar bench has also been designed for large motor-generators of capacity sufficient to generate current for running the motors on train and message circuits. The slate panel for this installation carries a reversing switch to permit switching from one regular source of supply (such as the city or round-house power) to the large reserve motor-generator in case of failure of the city or round-house power.

Space is provided for installation of voltmeters, ammeters and watt-hour meters.

Visual Signal Box

A manufacturer has developed a visual signal box containing six supervising signals arranged with contacts and connection for local battery bell attachment. This apparatus is especially valuable at junction points where the number of extension and selector bells become too numerous to be distinguishable and where the use of separate tone gongs will not meet the requirements. The contacts will repeat code rings on yard lines. The box is designed somewhat similar to a standard cordless jack box and may be double-decked when more than 6 signals are required.

Alternating Current Sounder

In the last report of this committee it was stated that the Pennsylvania Railroad was experimenting with an alternating current sounder. Experiments have recently been made with this sounder. And while the Western Union Telegraph Company has some in service, it is the opinion that considerable improvement can yet be made by perfecting the instrument so that it may be used wherever alternating current is available. 110-volt 60-cycle current is connected through an Edison cut-out with three-ampere fuses and in each branch of the alternating current supply there are 250-ohm resistance coils. The voltmeter reading across the terminals of these coils is 81 volts and the current consumption .042 ampere. Interposed between the relay points and the sounder is what is known as a "supply unit." This supply unit is in series with the main-line coils of the sounder and contains a fixed resistance and a condenser, also a fixed resistance which is in series with the shunt coils of the sounder. The shunt coils in the sounder are for the purpose of introducing a lag in the alternating current circuit, which counteracts the hum or vibration of the armature due to current alternations.

While the expense of installing an alternating sounder is greater than that necessary to install an ordinary sounder, the advantage is that where alternating current is available, it will not be necessary to furnish and maintain local batteries.

Telephone Operators' New Receiver

A new low-wound receiver has been developed during the past year which embodies some marked improvements over the present operators' receiver in respect to transmission and comfort to the operators. This receiver is about five miles of standard cable more efficient than the receiver formerly in general use, and the quality of the transmission is somewhat more distinct.

With its wire head-band, the new receiver weighs approximately 1½ ounces, or 25 per cent lighter than the present two-piece head-band receiver. The new receiver has a large ear-piece designed to fit the ear in a more comfortable and efficient manner.

A further advantage of the new receiver is with respect to maintenance. The case is made of metal and is not subject to breakage, nor is it easily damaged; therefore, it will not be necessary to remove these receivers from service as often as those having cases of other materials.

The Potts Simplex Printer

It is claimed that the Potts simplex printer has been developed to provide a direct keyboard page telegraph printer susceptible of use on any telegraph circuit. The machine is similar in appearance and operation to an ordinary typewriter. When used for telegraphic purposes, the handling is similar to the handling of a Morse wire. The machine is adapted for use on a way wire with a large number of stations, a direct line between terminals and on a duplex wire. If desired, it is possible to call any station selectively and if a message is transmitted, it will be recorded at that station and the home station. Direct current is required at only one station. At all way stations where printers are installed, current is required to run a small motor, which may be either D. C. or A. C. A fluctuating voltage has no effect on the accuracy of the machines.

The code adopted in connection with this printer is the well-known Baudot, which employs all combinations of five elementary impulses, giving thirty-two combinations, thirty-one of which are used.

A series of tests have been conducted on the Baltimore & Ohio Railroad to determine the adaptability of the machine to various working conditions. It is claimed the operation of the machines was very satisfactory on a straight wire, a simplex telephone and a composite telephone circuit between Baltimore and Cumberland, a distance of 200 miles with eighty volts at one end and grounded at the other end. Between Baltimore and Cincinnati, a distance of 600 miles, the operation was also satisfactory on a straight Morse wire and a duplex circuit. Repeaters and simplex telephone wires were in the circuits and no interruptions occurred. The

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ests were made in clear and rainy weather. The ests indicate that the machine possesses considerble merit as a semi-automatic sending machine.

Automatic Telegraphy

The Western Union Telegraph Company has reently made further experiments with multiplex rinting telegraph equipment and found that the ɔnger circuits gave much more satisfactory serice by the use of special apparatus.

From the beginning of the development of the nultiplex printing telegraph system in this country, : has been recognized that there are certain chemes which, while not necessary for use on the najority of the circuits, can be advantageously aplied to the longer circuits and those which involve pecial difficulties in operation. Two of these chemes have recently been applied to circuits of he latter classes with satisfactory results.

The first scheme comprises the use of double distributors at each multiplex set. This provides for he correction of distributor speeds made at both erminals of the circuits instead of at one end only, s in the more commonly used arrangement. As a esult, the operation of some circuits on which preiously it was impossible to obtain equal speeds of vorking in both directions, has been so improved hat the maximum output is obtained from both ides of the duplex.

With the second scheme a form of repeater has ɔeen introduced which is new to American prac-ice, although the principles employed are fairly vell known and have been applied in France in connection with the Baudot System. This is the nultiplex rotary or regenerative repeater in which, ɔy the use at the repeater station of distributors, synchronized with those at the sending stations, the repeating relays are controlled by only the central ɔart of each unit portion of all received signals, and n response to these impulses the distributors send ɔut signals of the same characteristics as those orig-inally transmitted from the terminal station. By this means it is possible to eliminate distortion of signals due to imperfections in their beginning and ending portions, which imperfections are often retransmitted by repeaters of other types.

Series and forked working of multiplex printing telegraph circuits will shortly be in operation in this country. Under this method of operation it is possible to have more than two stations operating simultaneously on the same circuit, that is, three or more stations may work in series on one circuit or one of the stations may be on a line branching from the main circuit. The principal advantage of this method of operation is the more efficient use of the wire plant.

Phantom Wiring

The New York Central Lines have made comparative tests of phantom wiring schemes for use in connection with A. C. Selectors. It was found that the repeating coil method of operation, whereby the repeating coil is used for the phantom telephone connection and also for telegraph composite connection, gives the best results. Duplexes at 80 volts can be operated satisfactorily for 150 miles. The phantom also is more quiet with the above arrangement than with any other arrangement tried.

Telephone Repeaters

The past year has witnessed a further large development in the commercial uses of telephone repeaters, particularly of the vacuum tube type. A very large number of these repeaters are now in service on long distance circuits in all parts of the country, bringing about large economies in construction and making possible service which would otherwise be commercially impractical. A very recent development in the use of repeaters is in long toll cables. An extensive application of repeaters has been made on the cable route between Boston and Washington; repeaters being located at Boston, Providence, Hartford, New Haven, New York, Princeton, Philadelphia, Elkton, Baltimore and Washington. Some of the installations are large. At Princeton, for example, several hundred repeaters are installed in a building erected especially for this purpose. The combination of repeaters and loaded cable conductors gives long distance circuits of a very high grade and of almost complete immunity from interruption. The toll cable system is being extended westward and within a few years is expected to provide connection betwen the cities of the Atlantic Coast and Chicago.

Audion Bulb

A small transformer and an audion bulb to be used as a source of sending battery for selector service has been developed. The equipment does the work of dry batteries, motor-generators or other sources of main battery. Laboratory experiments show satisfactory operation on a line 300 miles long equipped with 50 stations. 110 or 220-volt 60-cycle current is used on the primary side of the transformer. The apparatus may be arranged to produce direct current of any required voltage and its operation will be economical because no current is consumed except when signals are being transmitted. In addition to economy of operation, there are no moving parts to wear out and no batteries to maintain. It is proposed to mount the equipment in a steel box to meet the requirements of the underwriters; the entire space occupied will be small compared with the present type of installations.

Mechanical Belt Conveyors

The Western Union Telegraph Company is extending the use of belt conveyors for carrying messages from one part of an office to another. The belt conveyors have been found not only to reduce the "office drag" on messages, but have also largely reduced the cost for office messengers. In a recent installation it has been found that the introduction of the belts as a substitute for the messengers and the apparatus formerly employed, effected savings of several hundred dollars per month and reduced the "office drag" approximately 30 per cent.

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Submarine Cable Telegraphy

The Western Union Telegraph Company has put in an experimental installation of automatic printing apparatus on an ocean cable between Heart's Content, Newfoundland, and Valencia, Ireland, which proved satisfactory. As a result of this experiment further refinements have been made in the apparatus, also additional apparatus has been manufactured for equipping a number of long ocean cables. The new installations will shortly be placed in service. Automatic apparatus will be installed on the new cable to be laid between Miami, Florida, and Rio Janeiro.

Ocean cable relays and ocean cable magnifiers of new types and designs have been tested in an experimental way with promising results. Their use in commercial service has, however, been so limited that nothing definite has as yet been determined as to their value and efficiency in ocean cable operation.

Inductive Interference

The growing importance of inductive interference problems has been recognized in the reorganization of the National Electric Light Association by the appointment of a committee to specifically study inductive interference problems. This committee is through various sub-committees at work investigating different phases of the problem and is co-operating with telephone and telegraph companies.

Miles of Railroad Operated by Telephone

The Interstate Commerce Commission's report of January 1, 1920, shows that telephones are used for the transmission of train orders on 119,554 miles of road. This is an increase of 6,114 miles over the amount shown for the previous year.

The members of Committee No. 5 are:

J. A. Jones (chairman), superintendent telegraph Southern Railway System, Lines East.

A. C. Barfield, manager, Harland Engineering Co.

E. E. Dildine, superintendent of telegraph, Northern Pacific Railroad.

J. D. Jones, superintendent of telegraph and signals, Eastern Region, Pennsylvania System.

B. A. Kaiser, American Telephone and Telegraph Company.

D. McNicol, editor, Telegraph and Telephone Age.

C. A. Plumly, superintendent telegraph, The Baltimore & Ohio Railroad Company.

D. Sarnoff, commercial manager, Radio Corporation of America.

S. L. Van Akin, Jr., assistant superintendent of telegraph, New York Central Railroad Company.

At a Meeting of the General Committee of the American Railroad Association, held at No. 75 Church St., New York, on October 8, H. Hulatt, chairman of the Telegraph and Telephone section, accompanied by J. F. Caskey, retiring chairman, were present.

Report of Special Committee on Future Activities

The report of the Special Committee on Future Activities, George A. Cellar, chairman, submitted at the Winnipeg convention, September 22, 23 and 24, reads as follows:

The Special Committee on Future Activities reports the results of its deliberations and recommendations formulated at the meeting held in Atlantic City, N. J., on June 11, 1920, as follows:

The constant growth of the art of communication in railroad service, particularly the development of multiplex, printer, wireless, both telegraph and telephone, etc., demand that more attention be devoted to the technical training of employees entering the railroad field.

It is noted that under Exhibit C of the report of Committee No. 6—Message Traffic—presented at the December, 1919, session of the Division, mention of this subject was made, but we believe that the matter referred to should be handled by a special committee to be appointed.

The methods that should be adopted to induce young persons having inclination to enter the service and the opportunity afforded them to qualify in the several branches, should be given careful study to guard against the threatened depletion of aspirants.

The promotion of closer contact between the Telegraph and Telephone Division and other Sections and Divisions of the American Railroad Association was deemed advisable and in this connection the special committee was informed by the general secretary that the reorganization of the American Railroad Association, now in progress, will probably result in the formation of a co-ordinating committee which will bring about the desired unity of effort.

The special committee feels that comprehensive steps should be taken to encourage interest on the part of the younger representatives of members of the Division in technical and practical development in the work of the Division by assigning them to participate in meetings, preparation of papers, invitation to join discussions, etc.

Action also should be taken by the Division with other organizations and societies concerning the problems and personal aspects of the engineering relations with such organizations and societies.

The special committee desires also to call special attention to the economics of telegraph and telephone service, which subject it assumes has been or will be assigned to Committee No. 6—Message Traffic for consideration.

The special committee is of the opinion that a subject embracing instruments of precision as used in the testing of circuits and for other purposes should be given special consideration either by its reference to an existing committee or the appointment of a special committee to serve the purpose desired.

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The committee work of the Telegraph and Telephone Division having now a status of firm foundation, your special committee feels that the Division has reached a place where it can assume the consideration of technical and practical papers to be presented at the regular meetings and thus bring consideration of such matters as are thus presented, to the intimate attention of the representatives of members in attendance at these sessions, as well as those reached through publications. The special committee therefore recommends the appointment of a Committee on Topics to act under the regulations and present papers at each regular meeting of the Division in such number and character as may be approved by the Committee of Direction.

In the belief that development of the radio service since the war may continue to advance, it is our recommendation that a special committee composed of telegraph and telephone engineers of the Division be appointed to keep in close touch with the results obtained in an effort to determine whether the methods may be adapted to railroad service.

The development of the rotary repeater by the Western Union Telegraph Company has reached the point whereby multiplex printers are being operated San Francisco to New York, four channels, 83 words per minute. There are no patented restrictions in connection with the use of this repeater beyond those covering existing repeaters, which form component parts of the rotary repeater.

Your special committee, therefore, recommends that a special committee be appointed to consider the question of technical training along the lines indicated above and such other phases as may be developed.

Consideration was given to various items of interest such as have not already been apportioned among the various committees, and action taken resulted in the following recommendations:

The special committee feels it desirable to call attention to matters of broad general interest, although bearing only indirectly on subjects of prime interest to the Telegraph and Telephone Division.

The special committee feels, also, that a more intensive connection of the members of the Division with public affairs in general, promoting public welfare as well as the individual advancement of the Telegraph and Telephone Division and its members, is a matter which should be urged.

The special committee feels that the Division should offer the highest encouragement for the development of individual ideas in the promotion of fundamental advances in the art of electric communication and for original research in the field of electricity as applied to railroad telegraph and telephone communication.

THE TELEPHONE DIRECTORY for New York City in the year 1879 contained the names of but fifty-two subscribers.

Loud-Speaking Device Revolutionizes Ship Communications

Announcement was made by the Western Electric Company recently that for the first time in the history of vocal transmission, direct communication has been made with an outgoing steamer without the aid of any receiving apparatus. The experiment, which was made when the Cunard liner, *Imperator,* sailed for Europe recently, was pronounced a decided success by R. L. Jones, transmission engineer of the Western Electric Company and his coworker, R. C. Mathes, in a cable from England.

The passengers on the former German liner were amazed as they sailed down the North River and toward the Narrows to hear a deep, penetrating voice boom out apparently from nowhere, "Steamship *Imperator,* ahoy! Paging Mr. Jones, Mr. Mathes." The call which was repeated several times might have been that of a New York bellboy. There was only one difference—it was intelligible. Immediately all sorts of rumors began to circulate. Some folks with guilty consciences wondered if they had already passed the three-mile limit. There was one thing certain—some voice was coming out of the heavens, and it was not paying any attention to the cries of the sailors, the tooting of the tugs, or the chattering of the departing voyagers.

The only one on board who did not seem to show any wonder at the phenomenon was Dr. S. W. Stratton, Director of the United States Bureau of Standards. He cocked his ear, listened, and smiled. He had seen the imagination of Jules Verne and H. G. Wells outdone in the developments of the war-racked world during the last few years.

Seemingly, having located Mr. Jones and Mr. Mathes, the giant voice changed its bell-hop chant. "Bon voyage, Mr. Mathes. We hope your trip will be very pleasant. Just a minute now, and we will play you something," and in the same mystic fashion the sweet and clear notes of "It's Apple Blossom Time in Normandy," drifted over the ship.

"Good Lord!" shouted the pilot, "I'm about to pile this ship up on the rocks of some cabaret."

Before the scared mariner could carry out his threat, however, Mr. Jones explained to his fellow passengers who had collected in groups, that it was only his colleagues bidding him farewell from the Western Electric Laboratories at West Street. The "Giant Voice" was coming from one of the loud-speaking transmitters which was developed by the Western Electric engineers, and which had been set up in the window of Mr. Jones' office on the tenth floor. Amplified a million times, the voice of one of the engineers had carried distinctly to the passengers on the *Imperator.*

The loud-speaker had never been tried before under such adverse conditions. The success of the experiment only forecasts other remarkable achievements for it.

PLATINUM was discovered in the year 1750, by William Watson.

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Sending Telegraph News in China

By WALTER B. CLAUSEN

Cable Editor, Western Division, Associated Press

The Chinese typesetter, who trots off miles in his daily marathon between the high cases containing 6,000 or more characters in general use by Chinese newspapers, is quite well known among those who have inquired into newspaper methods of foreign countries. But, when a big story breaks, one that deserves black circles, which correspond to our page one banner head lines, how does the bulletin get from Foo-Chow to Canton? How do these strokes and twists and dots which go to make up the Chinese character get over the wire? That's where the operator comes in.

A 9,000 figure code does the trick. Associated Press operators had a taste of something akin to Chinese telegraphy in July, 1917. Few operators who sat in on the wires July 20 or 21 will forget their experiences in copying the selective draft figures. But that forms the major part of the Chinese operator's work, for the number of messages handled in foreign languages is small compared with that handled in Chinese, and all Chinese messages go in the number code.

There are some 40,000 characters in the Chinese language. The number telegraph code runs up to 9,999 taking in about one-fourth of the characters but embracing practically all that are in general use.

The amazing mental powers of the Chinese is demonstrated in that many of the more than three thousand Chinese telegraph operators in China have memorized the nine thousand figure code and send messages direct from the Chinese character copy, in the manner in which the Phillips code is used in this country.

Chinese telegraph communication is still in its infancy, insofar as development of territory is concerned. There are but 42,518 miles of land line, according to statistics of last year, with 1,789 Morse instruments and 47 Wheatstone instruments in operation at 710 stations. The United States has more than 237,000 miles of lines and over 28,000 telegraph stations. And China is one-fourth larger than the United States and its population is four times as great.

Since the 1911 revolution, which gave birth to the Chung Hwa Republic, telegraphy has played an increasingly important role in the advancement of the press in China. Provincialism has given way to extensive inter-provincial news and some foreign matter.

Press rates are effective throughout China, being three cents Mexican currency, or one-quarter of the full rate for Chinese language matter, and six cents, or one-third the full rate, for foreign language matter.

With practically all telegraph communications controlled by the government, official business is given preference, causing rather indifferent service to commercial matter. This is particularly noticeable in the districts near Peking, where complaint is often voiced that mail or courier service is frequently more efficient than the telegraph, owing to the great amount of official business carried on the wires.

Foreigners who have watched Chinese operators work declare they compare favorably with expert telegraphers in other countries—often excelling in speed and accuracy. This is particularly demonstrated by the efficient Chinese operators employed in the cable office, where they are preferred even to the experts of the nation controlling the station.

Reception by sound is most common in the central and larger offices, while the tape recorder system is used in the small interior towns. The Continental Morse code is used.—*Service Bulletin of the Associated Press.*

———o———

Large Terminal Rack

The largest telephone terminal rack in the world is in operation today in San Francisco, just completed at great expense by the Pacific Telephone and Telegraph Company and installed in the lower floors of its Bush Street building.

The rack, or main distributing frame, through which three exchanges, with 53,000 subscribers, operate, has about 250,000 connections. It is 52 feet 8 inches long, 18 feet high, and 5 feet deep, and rests in a pit. Along its side are ranged a half-dozen sliding ladders, so that the wiremen, who are at work continually along its length, can reach every one of the connections on the board.

Upstairs, in the Sutter, Kearny and Douglas exchanges, a thousand girls are employed in making connections for the business section of San Francisco. Into this rack come all the wires from the exchange board, 6,000 trunk lines from the thirteen other San Francisco exchanges, and 500 trunks from the transbay cities and San Mateo County. Each line necessitates four wire connections—two on the terminal rack, a third picked up on the next floor and used to operate relays, and a fourth at the exchange switchboard.

To the uninitiated, looking at the mammoth rack with its jungle of tiny insulated wires, the entire plant seems a mystery. But to the men who walk back and forth along the board, connecting a wire here and disconnecting another there, its operation is simple. Here and there are fuses that would save the company from heavy losses should some high-voltage wire cross a telephone line anywhere in the city. On each of these fuses and on each terminal a small number tells the operative whose telephone depends upon this connection.

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JAMES A. GARFIELD was the first President of the United States to use the telephone. In the year 1878 he had a telephone installed in his residence in Washington.

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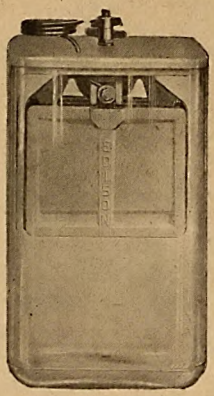
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

FOR SALE

Approximately two miles of used 10-conductor Armored Submarine Cable, in first class order. This cable is 14 B & S stranded, 9/32" wall. Kerite insulation and make.

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SELENIUM CELLS

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Write for catalog send 10 cents in stamps

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Student's Course in Technical Telegraphy

LESSON No. 14

The attempt often has been made to explain the operation of telegraph duplex, quadruplex or repeater circuits to students by direct reference to wiring diagrams. The student is told that the rheostat does so and so, the condenser does something else, and that induced currents perform certain other functions. The student is in a very difficult position if he already has not learned the construction of and action of the various devices included in the make-up of a set of apparatus.

Almost any person engaged in the telegraph business may be expected to understand references to the action of keys, relays, sounders, etc., but when the instructor uses such terms as rheostat, condenser, induction coil, or transformer, without first explaining the operation of these instruments, the student may well be pardoned for not intelligently following the argument.

THE RHEOSTAT

A rheostat is an assembly of resistance coils conveniently boxed and mounted so that the total resistance of the instrument may be varied, say, from one ohm to 10,000 ohms. The various resistance units within the box are connected into a circuit by means of small plugs or radial switch-arms.

Suppose we have a generator producing 24 volts and it is desired to connect it to a telegraph sounder having a resistance of 4 ohms, and which requires an operating current of one-fourth ampere. By means of Ohm's law it may be determined that unless additional resistance is connected between the generator and the sounder, 6 amperes will flow in the circuit. In an ordinary sounder circuit this quantity of current would blow out the fuses if it did not first burn out the sounder coils. Therefore, in practice a resistance coil of 92 ohms (90 would answer) would be placed in series with the sounder coils so that a current of one-fourth ampere would flow in the circuit. In this application the additional resistance in the form of a coil acts simply as a rheostat—that is, a regulator of current strength. The term rheostat as usually employed signifies an adjustable resistance, and there are various forms of the instrument used for different purposes.

THE CONDENSER

A common type of electric condenser is made up of alternate layers of tin foil and of paraffined paper, one-half of the number of sheets of tinfoil being joined together by soldering and connected to one terminal of the condenser unit while the other half of the tinfoil sheets are likewise joined together at the edges and wired to the other terminal of the condenser.

Fig. 30 shows a two-plate condenser with air insulation connected to a source of electromotive force, the other terminal of the condenser and the other terminal of the battery being grounded, in effect forming a completed electric circuit with a condenser in series.

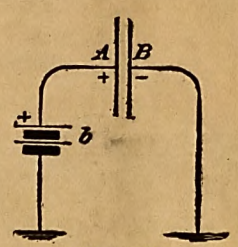

FIG. 30

The positive pole of the battery is connected to one side of the condenser, which gives to that plate a positive charge of electricity, while the opposite side of the condenser is charged negatively. The condenser acquires a charge in proportion to the applied electromotive force and to the size and number of metallic sheets or plates used in its assembly—also to the nature of the substance used as the insulation between the individual sheets, whether it be glass, mica, paper or air. Even after

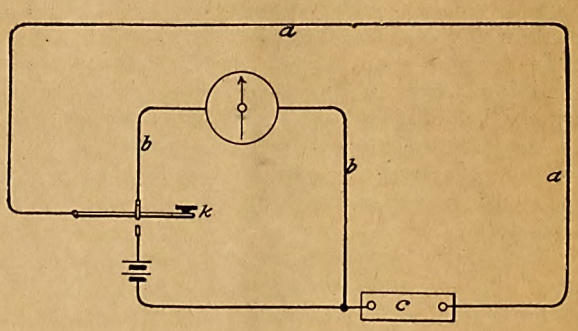

FIG 31

the battery connection has been broken the condenser continues to hold its charge.

If a circuit is arranged as in Fig. 31, including a battery, key, condenser and galvanometer, the action of the condenser may be investigated. When the key is depressed a circuit is completed which includes the battery, the key and the condenser—

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circuit a, and the condenser is immediately charged. If now the key is opened it may be seen that a circuit is made up which does not include the battery —circuit b, but which includes only the condenser and the galvanometer. When the key is opened the electric pressure which charged the condenser is removed and a new path is provided by way of the galvanometer through which the condenser may discharge. The discharge is evidenced by a sudden kick of the galvanometer pointer in one direction, the pointer immediately returning to the zero, or no-current position.

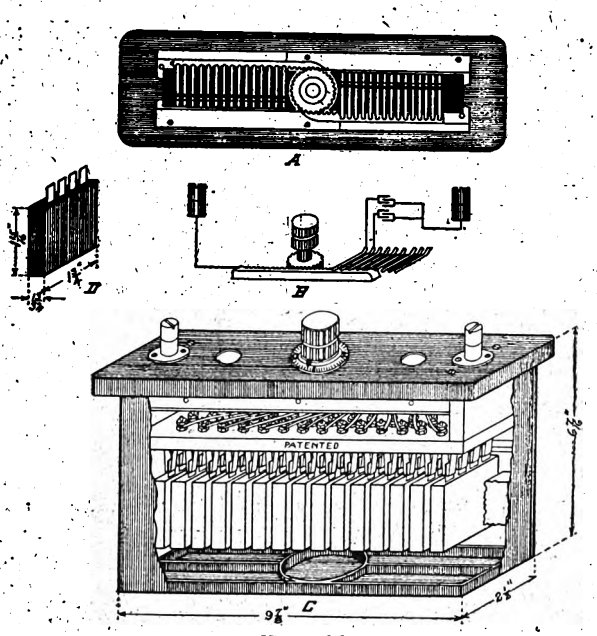

FIG. 32

The fact that the pointer returns to the upright position quickly indicates that the flow of current through its coil was but momentary, and that the charge held by the condenser was immediately dissipated when a path was provided which did not contain any other source of current.

In telegraph operations electric condensers are used for various purposes, which shall be described when the subject of apparatus management is reached. The action of the condenser as illustrated in Fig. 31 should be studied so that its principle may be understood later on when this information is necessary.

Fig. 32 illustrates a form of adjustable condenser used in duplex and quadruplex working. The lower portion of the illustration shows the two binding-post terminals which are connected to the condenser plates, and, in the center on top of the box, a knob which, when turned one way or the other, cuts-in, or out, units of the total capacity of the condenser so that the capacity at the terminals may be of any value from one-tenth microfarad to three microfarads—these being the units by which capacity is measured.

On the left is shown one of the capacity units which in the assembly of the complete condenser may be readily inserted in spring clips. In the center of the illustration the action of the knob in varying the capacity may be seen. By means of a rack and pinion movement the number of individual capacity units in circuit may be regulated.

(To be continued)

Appeals From Berlin and Vienna for American Food Drafts for Telegraphers

Appeals are being received from telegraph employees in Berlin and Vienna asking that food drafts be forwarded for the relief of operators in those cities who, according to reports, are on short rations due to the low value of money and scarcity of food.

L. D. Beall, of Vice-President J. C. Willever's office, Western Union Telegraph Company, New York, has interested himself in particular cases and has forwarded paid food drafts by means of which provisions may be procured from the American Relief Administration's stores abroad.

One appeal recently received was signed by "Nineteen telegraphers and two clerks of the Railroad Administration, Vienna, east station," followed by their individual signatures. One received on October 6 is from Margarete Pelz, Berlin, S. W. 29, Bergmanster, I, II. Miss Pelz states that she is a telegrapher in Berlin and that she has no relatives in America to whom she can write for assistance.

Teletype Telegraph Printer

An installation of the Morkrum Company's Teletype printer was placed in service by the Associated Press on August 3. It is stated that the machines operated over a period of six weeks without requiring any alterations in adjustment.

S. O. S!

WILL YOU ANSWER THIS CALL?

ADVANCEMENT and BETTER PAY are AWAITING those who take up the study of Electricity.
THE NEW YORK ELECTRICAL SCHOOL instructs you in the PRACTICAL and THEORETICAL elements of electricity. You acquire BY ACTUAL PRACTICE and EXPERIENCE the art of Electrical Drafting, the most efficient business methods of Electrical Contracting, together with the skill to install and operate all systems for producing, transmitting and using Electricity
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Write for Information
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SUBMARINE CABLES

All-America Cables

E. H. Earles, of New York, is relieving Manager Yates, at the Fisherman's Point station, while Mr. Yates is on vacation.

W. A. Sangster, of the Lima station, retired on pension on August 31.

C. D. Atkinson, of the operating staff, left New York for the station at Santa Elena, on August 26.

J. R. Cotter has resumed management of the station at San Jose.

M. H. Reynolds, attached to the Washington, D. C., staff during the past three years, has returned to the New York office.

H. E. Mador left New York for Galveston, Tex., on September 10. J. E. Lauri also goes to the Galveston office.

J. E. Robbins has been appointed Captain of the cableship *Guardian*.

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Cable Staff Transfers

Western Telegraph Company: R. George, from Rio de Janeiro to Pernambuco; C. L. Stansell and K. G. Morse, Buenos Aires to Rio de Janeiro; H. S. Ramsay, Santos to Madeira; A. E. Emerson, on leave to Rio de Janeiro; J. D. Bards and J. W. Squirrel from England to Montevideo.

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Commercial Cable Company's Station, Waterville, Ireland

Albert Murray, assistant superintendent at this station, in the month of July had to give up to fortunate suitors two of his charming daughters. Miss Evelyn Murray was married on July 1, to C. R. Vivian of the Commercial Cable Company's Waterville staff. Mr. Vivian was formerly in the service of the Eastern Telegraph Company. Miss Josephine Murray was married on July 24.

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Eastern Telegraph Company's Cable Steamers

The Eastern Telegraph Company's fleet of cableships, which include the steamers *Cambria, John Pender, Transmitter, Amber, Britannia, Levant II, Electra* and *Sherard Osborn,* has recently been increased by the addition of the newly constructed steamer, *Lady Denison-Pender.*

The hull of the *Lady Denison-Pender* was launched on the Clyde, on May 29, last. The vessel is a twin-screw steamer of the shelter deck type with long bridge and cruiser stern; especially designed for the laying and repairing of sumarine cables. She is 282 ft. 8 in. in length, 38 ft. in width, 25 ft. in depth to shelter deck, of 2,000 tons gross, and 1,900 tons carrying capacity on a draught of 17 ft. 6 in., and at a speed of 12 knots. The ship is rigged as a two-masted schooner, with two five-ton derricks on the foremast. There are three cable tanks, having a total capacity of 20,830 cubic feet, which is equivalent to 600 nautical miles of cable. There are also two sets of the latest type of cable-working machinery, with bow-sheaves of an improved pattern. There is accommodation for a complement of 100 persons, with hospital, surgery, cable testing room, chart room, work shop, etc.

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Speed Limit of Ocean Cables

In the paper, "Multiplex Telephony and Telegraphy Over Open-Circuit Bare Wires Laid in the Earth or Sea," by Major-General G. O. Squier, published in the July 16 and August 1 issues of Telegraph and Telephone Age, it was stated that "The best Atlantic cable of the present day is limited in operation to electric waves of frequency of the order of 10 cycles per second. . . ."

With reference to this figure, Thomas B. Dixon, New York, calls attention to the demonstrated speed possibilities of long cables when the Dixon selenium cell magnifier is used, pointing out that 10 cycles per second represents a speed of but 324 average cable letters per minute as measured by the standards commonly in use. Further, as General Squier applies the 10-cycle figure to "the best Atlantic cable," reference is doubtless made to the '94 cable of the Anglo-American Telegraph Company, as it is well known (and is so recorded in Bright's work, "Submarine Telegraphs") that that particular cable has a recorder speed of 250 letters per minute. None of the other Atlantic cables has unmagnified recorder speeds in excess of 200 letters per minute.

The normal recorder speed of the cable on which were made the tests with the Dixon selenium amplifier (magnifier) described in Telegraph and Telephone Age of September 16, 1920, is only 190 letters per minute, while at a speed of 450 letters per minute attained in the commercial handling of business—as reported in the September 16 issue—the electric waves were of a frequency of approximately 14 cycles per second. An experimentally demonstrated speed showed 636 letters per minute, a frequency of nearly 20 cycles per second, or practically double the speed quoted in General Squier's paper as being possible on the best cable.

Allowing the same percentage of gain by the Dixon apparatus on a 250-letter cable as on a 190-letter cable, the former would have its speed increased to 836 letters per minute, or nearly 26 cycles per second.

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Telephone Growth in Western Canada

British Columbia

A net increase of 4,400 telephones (13.9 per cent.) in Vancouver alone is shown by figures compiled by the British Columbia Telephone Company. On Vancouver Island the exchanges outside of Victoria show an increase in the past year of 17.4 per cent.; for Victoria City the first 11 months of last year show 1,577 net additions.

Vancouver city has 34,000 phones, and with the outlying exchanges, 45,000. Victoria has 11,677 phones. The services throughout British Columbia approximate 60,000, of which about 25 per cent. are on Vancouver Island. The rates charged in British Columbia are on a level with those in American cities whose populations range from 100,000 to 225,000. The local telephone company is, however, requesting the Government for authority to increase the charge for pay stations from 5 to 10 cents.

Contracts have been awarded for the installation of the first unit of an automatic telephone system for Vancouver, and it is hoped the entire system may be in operation by March, 1922. The central-office equipment to be installed is of the same type as that which will be used in eastern Canadian cities and in New York, Kansas City, and Seattle. The first area to be supplied will be one of the most congested residential districts in the city.

Alberta

Of the $3,500,000 telephone-construction program planned for this year in Alberta, nearly $3,000,000 has already been expended in building 6,650 miles of long-distance and rural telephone lines and providing for branch exchanges and stations. According to charts in the office of the telephone department of the provincial government to date this year there has been constructed 4,200 miles of long-distance toll lines and 2,450 miles of rural telephone lines. A large amount of construction work is still under way or planned to be completed this year, including a number of areas east and southeast of Calgary.

The contract for the new telephone station on the north side in Calgary has been let. Construction work on it will be pushed rapidly. Another branch exchange for the west side in Calgary will be built next year. This plan of proceeding with the branch exchange, instead of constructing a new addition to the central exchange, was finally decided on to save time, as figures obtained by the engineers showed it would require two years before an addition to the central exchange could be completed and the lines divided and transferred.

In addition to the branch exchange in Calgary a new exchange is being constructed in Red Deer, where the government recently acquired the telephone system, and another branch in the city of Lethbridge. The Red Deer exchange is estimated to cost some $50,000 and the Lethbridge one about $25,000.

British Cable Communication With Canada

The Manchester, England, Chamber of Commerce Monthly Record for July, 1920, contains the following letter received by the president of the Manchester chamber from the British Postmaster General:

"I am directed by the Postmaster General to draw the attention of your chamber to the fact that a State-owned cable is now working between this country and Canada, and that telegrams for North America, the West Indies and Australia may be sent over it if handed in at the post office.

"It is the desire of His Majesty's Government that this cable, which is known as the Imperial cable, should be used mainly, if not exclusively, for traffic between this country and British Dominions. It is well adapted for this purpose, as it works direct between the Central Telegraph Office, London, and Halifax, Nova Scotia, where connection is made with Canadian land lines as well as with a British cable to the West Indies. Australasian traffic is sent by a special line direct from Halifax to Bamfield (Vancouver Island), and thence by the State-owned Pacific cable to Australia and New Zealand. A telegram from London to Australia thus reaches the Pacific cable with only one retransmission (at Halifax).

"The rates for ordinary telegrams sent by the Imperial cable are the same as those by other Atlantic cables; but the Imperial route is at present the only Atlantic route on which the deferred service has been restored. Deferred telegrams can be sent by the Imperial cable at the following rates per word: Canada—Eastern Provinces, 4½d.; Manitoba, 7d.; western Provinces (excluding the more inaccessible parts of British Columbia and the Yukon), 7½d.; Jamaica and Bermuda, 1s. 3d.; Australia, 1s. 6d.; New Zealand, 1s. 4d. A deferred service is in operation at the same rates in the reverse direction for telegrams routed for transmission by the Imperial cable—or, in the case of Australasia, by the Pacific cable."

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

French Balloonists flew across the English Channel in the year 1783.

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Radio Telegraphy

Radio Corporation of America

THE COMMERCIAL DEPARTMENT recently held a conference at New York, which was attended by the division superintendents and district managers to the number of ten, and which extended over a period of several days. Topics of mutual interest were discussed and plans made to secure closer cooperation and more uniform working. These conferences will probably be held periodically.

PRESIDENT E. J. NALLY, accompanied by Mrs. Nally, is spending a few days at Lexington, Ky., Mrs. Nally's old home.

MAJOR CHARLES P. BRUCH, of the Pan-American Wireless Telegraph and Telephone Company, is due to arrive in New York from Buenos Aires about October 18.

F. D. HEISER has been appointed acting assistant superintendent of the station at Chatham, Mass.

WILLIAM COCKETT, auditor of receipts, has returned from a visit to his old home in England. In the October 1 issue of TELEGRAPH AND TELEPHONE AGE it was erroneously stated that Mr. Cockett had been laid up for some time on account of a wound received in France during the war.

GEORGE A. BELLIS, of the auditing department, has returned to duty after undergoing tedious treatment for a wound in the leg received in France some months before the armistice.

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New Poulson Radio Station in Oregon

The Federal Telegraph Co. has prepared plans for the erection and equipment of a radio station in Washington county, Oregon, 22 miles west of Portland. The equipment will consist of two motor-generator sets, each comprising a 130-H.P., 2300-volt, three-phase synchronous motor, driving a D. C. generator. The two units will operate apparatus of the Poulsen radio system. There will be installed two 15-H.P. motors for operating the auxiliary apparatus connected with the radio station. Plans also provide for the erection of steel towers to support the antennae. This station will be on the distributing lines of the North Coast Power Co., Portland.

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Wireless Telephones for Canadian Forests

The British Columbia forestry branch has recently closed a contract with the Marconi Wireless Telegraph Company of Canada for the installation of four land stations and five launch equipments, for use in forestry fire protection work. One station, at the forestry office in the courthouse, Vancouver, is already installed, and the first installation on one of the small gasoline boats has been placed. Successful tests have been carried out between these two stations at distances varying up to 75 miles. On account of the rugged character of the coast country this distance is the limit of the radius to be attempted for the present, although the extreme radius of the wireless telephone is stated to be 300 miles over flat land or over water.

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International Radio Telegraph Company

The International Radio Telegraph Company as reorganized has as officers: Guy E. Tripp, chairman; E. M. Herr, president; S. M. Kintner, Calvert Townley and H. P. Davis, vice-presidents, and John V. L. Hogan, manager. With the exceptions of Messrs. Hogan and Kintner, those named are officers of the Westinghouse Electric and Manufacturing Company. L. W. Chubb of the Westinghouse Company also will be directly connected with the radio company.

The capital stock of the company will be $1,250,000 of preferred, and 250,000 shares of common stock having no par value.

A factory for the manufacture of radio apparatus has been equipped at East Springfield, Mass.

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Wireless on American Ships Arriving at United Kingdom Ports

Vessels of the United States on arriving on and after December 1, 1920, at ports of the United Kingdom will be subject to the provisions of the British wireless act of 1919, so far as applicable.

This act requires every seagoing passenger steamer or ship of 1,600 tons gross tonnage or upwards shall be provided with a wireless telegraph installation.

The wireless installation shall comply with the requirements of the International Radiotelegraph Convention, 1912, as modified by any other international agreement (and in particular the International Convention of Safety of Life at Sea, 1914) or of any international agreement by which the said convention of 1912 may be superseded.

Ships carrying 200 persons or more which are not engaged in the coasting trade, on voyages exceeding 48 hours from port to port, must carry three operators; on voyages exceeding 8 hours but not exceeding 48 hours from port to port, must

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carry two operators; on voyages not exceeding 8 hours from port to port, must carry one operator.

Ships not engaged in the coasting trade carrying 50 but less than 200 persons and ships engaged in the coasting trade carrying 50 persons or more, on voyages exceeding 48 hours from port to port, must carry one operator and two watchers; on a voyage exceeding 8 hours but not exceeding 48 hours from port to port, must carry one operator and one watcher; on a voyage not exceeding 8 hours from port to port, must carry one operator.

Ships carrying less than 50 persons shall carry one operator.

An operator holding a cargo grade license issued by this government is qualified to be a watcher.

Dinner to Radio Men

On the evening of October 6 a dinner was given at the Cafe des Beaux Arts, New York, by M. C. Rypinski of the Westinghouse Electric and Manufacturing Company to L. W. Chubb of the International Radio Telegraph Company. The guests included J. V. L. Hogan, president of the Institute of Radio Engineers; Alfred N. Goldsmith, in charge of the communication laboratories, College of the City of New York; Lloyd Espenschied, American Telephone and Telegraph Company; Donald McNicol, editor of TELEGRAPH AND TELEPHONE AGE, and L. R. Krum, in charge of the ship service for the International Radio Telegraph Company. After the dinner the party attended the regular monthly meeting of the Institute of Radio Engineers, in the Engineering Building, at which a paper on "Radio Taste Reception" was presented by Messrs. A. N. Goldsmith and E. T. Dickey.

IN ARGENTINA, the government has recently established radio telegraph stations in Buenos Aires, and at the ports of Gaiman, Rawson and Gallego. These are to be operated in connection with the stations to be maintained at Corrientes, Bahia Blanca, Cordoba and Rivadavia.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"

By ELLERY W. STONE

This new book is just the thing for the Commercial or Railroad Morse Telegrapher who desires to learn the theory and practice of radio telegraphy. In its treatment of the subject the book is simple, but thorough.

$2.50 per copy.

Proposed Installation of a Wireless Station at Geneva

The Swiss Federal Government is receiving bids for the installation of a wireless station at Geneva in view of the convocation there of the League of Nations in November. The eventual need for a permanent station is foreseen. Meanwhile, a plan for installing a temporary station, which would be ready by November 1, has been considered but has been definitely abandoned. The Marconi Company of London proposed the construction by the first of November of a station of 6 kilowatts, at a cost of £10,400, but as such a station would have insufficient carrying power the proposal was rejected.

Until better means of wireless communication from Geneva become available, two proposals have been made: One is to send telegrams by ordinary telegraph lines to Lyon, to be relayed from there to all parts of the world. A second proposal is to utilize the Lyon station, by the use of a special wire, directly from Geneva. This would require the consent of the French government, which has been requested.

Meanwhile the study of the question of a permanent station continues. It is believed that the construction of a station of equal power to that of Nauen would cost more than $4,000,000. One firm has, however, proposed to install a station equivalent in power to the Nauen station, but less complete, for approximately $1,000,000. It would be necessary to add to this sum an expenditure of about $150,000 for the housing of the apparatus.

Extension of the Mexican Wireless Telegraph System

Particulars regarding the proposed installation of new wireless stations in Mexico at a cost of $250,000 United States currency have been forwarded by Trade Commissioner Cunningham, who states that bids from American companies for the immediate equipment of this service are desired by the Director of Telegraphs of the Mexican government.

Radio-telegraph stations of the following three kinds are to be installed in different parts of the Republic:

1. Those capable of communicating with the capital, equipped with ten-kilowatt transmitters.
2. Those equipped with five-kilowatt transmitters.
3. Those equipped with two-kilowatt transmitters.

The stations of the first category, which will be the principal centers of communication, will relay the messages from weaker instruments; all the messages which can not be sent by these latter instruments any great distance will be sent by the central stations over the shortest route. These stations will be situated in the cities of Chihuahua, Saltillo, Torreon, Hermosillo, Mazatlan, Manzanillo, Vera Cruz, San Cristobal, Las Casas and Merida.

The stations of the second category will be in the ports and capitals of the States being able to

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communicate with one or two of the central stations mentioned above. Many of these stations of the second category, because of their situations, may also be able to communicate directly with the capital.

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Independent Telephone Pioneers Organize Association

The Independent Pioneers' Telephone Association was organized in Chicago, Ill., on September 24. Hart F. Elwell, of Terre Haute, Ind., was named president, and J. K. Johnston, of Indianapolis, Ind., secretary-treasurer.

The membership requirements of this new social organization are that applicants must have been engaged in the telephone or an allied business fifteen years, and at the time of application in the employ of an independent telephone organization.

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International Association of Municipal Electricians

The 1920 convention of the International Association of Municipal Electricians will be held in New Orleans, La., on October 19, 20, 21 and 22. This will be the twenty-fifth annual gathering of the members of the Association.

The membership is comprised of city electricians, city electrical inspectors, superintendents of fire alarm and police signal telegraph, and engineers of municipal electric light and power stations.

The Association has as members practically all of the foremost men at the head of municipal electrical departments in the cities and towns in the United States and Canada.

Clarence R. George, secretary, of Houston, Texas, advises that an interesting and instructive program has been provided for the New Orleans meeting.

Robert J. Gaskill, of Fort Wayne, Ind., is president; Charles P. Steinmetz, of Schenectady, N. Y., first vice-president; R. C. Turner, of Atlanta, Ga., second vice-president; W. P. Briggs, of New Bedford, Mass., third vice-president, and F. A. Cambridge, of Winnipeg, Man., fourth vice-president.

Walter L. Dilzell, city electrician, New Orleans, La., is chairman of the committee on arrangements.

———o———

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

Telegraph and Telephone Life Insurance Association

Assessments 683 and 684 have been issued to cover the claims arising from the deaths of Chauncey T. Raymond, John J. Flynn, Rudolph A. Boyle, Abbot L. Burroughs, James I. Foster, Francis Benner, Horace J. Hale and Charles H. Thomas.

———o———

In Bolivia a new telegraph line has been constructed from Sucre to the terminal line of the Acre bridge, making a new circuit which will include Cochabamba, Oruro, and the system of the southern part of the Republic.

In Brazil, the government has authorized the Havas Agency to establish a radio telegraph station in Rio de Janeiro for sending and receiving radio news messages.

In Peru, a new radio telegraph station was opened at Trujillo on June 11, last.

The Phonograph was invented by Edison in the year 1876.

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Will Want a copy of This New Book

The book of telegraph penmanship containing prizewinning specimens submitted in contests recently participated in by railroad and commercial telegraphers.

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In handsome library binding, containing eighty pages of text and fac-simile zinc etchings illustrating the penmanship of some of the most artistic teelgraph penmen in the country.
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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

J. O. CARR, sales engineer, Morkrum Company, Chicago, Ill., was in New York during the first week in October on a business trip. Before returning to Chicago, Mr. Carr will visit his home in Vermont. He is accompanied by his wife and child.

EDWIN P. KOUKOL, of the Morkrum Company, Chicago, has been transferred to New York, where he will represent the company's interests.

EDOUARD BELIN, a French inventor, is now in this country demonstrating his inventions, which provide for the transmission of photographs by wire.

LOUIS M. POTTS, heretofore chief engineer of the Universal Machine Company, Baltimore, Md., and inventor of printing telegraph systems, has joined the engineering staff of the Western Electric Company, New York.

ARTHUR BESSEY SMITH, of the Automatic Electric Company, Chicago, Ill., was a New York visitor on October 4 and 5.

DR. FRANK A. WOLFF, in charge of the telephone division, Bureau of Standards, Washington, D. C., was a New York business visitor on October 4.

E. M. JOYCE, telegrapher in the general office, Southern Pacific Railroad, Los Angeles, Cal., and formerly captain in the Signal Corps, United States Army, is seriously ill at Thornycroft Hospital, Glendale, Cal.

MANUEL MALLO GILL and JUAN F. AGUIRRE have been appointed by the President of Cuba as delegates to the International Communications Conference now being held in Washington, D. C.

Your Money's Worth

One would have a hard job finding anything of use which today sells for the same price it sold for before the war. Everything that goes into manufacture and production of any sort has increased in cost 100 per cent. or more. TELEGRAPH AND TELEPHONE AGE, however, is not only still selling at pre-war figures (two dollars per year), but it is a more useful journal today than ever before. If the reader is not a regular subscriber he should lose no time in sending in his name while the present low subscription rate remains in force.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD REYNOLDS, vice-president and general manager, accompanied by C. A. Richardson, superintendent at Albany, N. Y., is making an inspection of offices in the second district, Eastern Division.

E. P. TULLY, assistant to the general manager, recently paid an official visit to offices in Massachusetts.

J. F. HEARD, division engineer, Southern Division, recently completed the installation of new equipment in the Cotton Exchange branch at Savannah, Ga.

W. W. MORRISON, superintendent at Los Angeles, Cal., spent his summer vacation at Twin Falls, Idaho.

H. R. DAVIS, of the division engineer's office, Chicago, was in Cleveland, Ohio, recently, in connection with the remodeling of the office.

SYBELL L. GIBSON, of Fulton, N. Y., has been appointed manager at Baldwinsville, N. Y.

W. A. MORAN, night chief operator at Buffalo, N. Y., has returned from his annual vacation.

GEORGE DOWNEY, manager of the Fish Pier office, Boston, Mass., is again taking care of the football file at Soldier's Field, Saturday afternoons. He will also have charge at the Harvard games.

MANAGERS APPOINTED: W. W. Garland, Henderson, N. C.; J. A. Frost, Brewster, Fla.; F. O. Hooper, Taunton, Mass.; M. M. Matthews, Fernandina, Fla.; W. L. Lowry, Port Arthur, Tex.; Ethel S. Emery, Augusta, Me.; M. J. Disy, North Adams, Mass.; A. J. Albrecht, Port Huron, Mich.; C. Benford, Quitman, Ga.; M. Gasper, La Salle, Ill.; Mrs. J. G. Faulkner, Helena, Ark., and Mrs. C. L. Markham, York, Ala.

New York Postal

RALPH CARR, loop chief, in the main operating room, and R. J. Tyrell, of the service department, are spending their vacations in Pennsylvania.

MISS M. HOGAN, of the service department, is spending her vacation at Atlantic City, N. J. Edna Wall, of the same department, is spending her vacation at points in New York State.

A. F. KAVANAUGH, chief clerk, has returned to duty after a long spell of illness.

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Chicago, Ill., Postal

C. B. Lee, of the Battle Creek, Mich., office, was a recent visitor at the general offices, Chicago.

F. W. Brock, operator at Kewanee, Ill., has been advanced to the position of manager of that office.

G. Gory, formerly manager at La Salle, Ill., has been promoted to the managership of the Pontiac, Mich., office.

Albany, N. Y., Postal

A. E. Montville, manager at Lake Placid, N. Y., has been transferred to the Syracuse, N. Y., office. He is succeeded at Lake Placid by Lyle Von Arx.

H. A. Benjamin, of Hudson, N. Y., has been appointed manager at Amsterdam, N. Y., vice N. L. La Fave, resigned to take a college course.

Miss A. M. Howard, of Hudson Falls, N. Y., has been appointed manager at Saratoga Springs, N. Y., vice Miss H. A. McCreedy, resigned to enter other business.

Mabel G. Bump has been appointed manager at Hudson Falls, N. Y.

The Office at Hudson Falls, N. Y., has recently been moved into larger quarters, with up-to-date facilities.

P. M. Bachelder, chief clerk to Superintendent Richardson, recently spent a day with Manager Durgin at Worcester, Mass.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

And we can highly recommend it to our readers

$2.50 per copy

From TELEGRAPH AND TELEPHONE AGE

253 Broadway, New York

Book on Mathematics

Mathematics for Engineers, Part II, by W. N. Rose, is now ready for delivery. Volume I of this excellent work on mathematics found a ready sale among telegraph and telephone engineers, and those who have copies of the first book will find the additional volume of material assistance in gaining a knowledge of advanced engineering mathematics. The price is $7.00 per volume—From Telegraph and Telephone Age, 253 Broadway, New York.

WESTERN UNION TELEGRAPH CO.

W. McD. Milne, chief division auditor, New York, has been transferred to the Lake Division, Chicago.

A. H. Sprague, division auditor, Lake Division, Chicago, Ill., has been transferred to New York.

S. L. Burts, division superintendent of traffic, Southern Division, Atlanta, Ga., was a recent executive office visitor.

H. C. Worthen, general manager, Southern Division, Atlanta, Ga., was an official visitor at New York headquarters recently.

J. B. Norcross, superintendent of telegraph, Maine Central Railroad, was an executive office visitor on October 13.

O. J. Nourse, of Vice-President Fashbaugh's office, is on a trip of inspection to terminal offices in the Middle Western States.

Louis Casper, general inspector, Traffic Department, has returned from a trip to Havana, Cuba, where he went on company business.

Stanley Smith, late night chief operator at Bristol, Tenn., has been promoted to the position of chief operater at Chester, S. C.

G. E. Sharp, district plant superintendent, Cleveland, Ohio, recently held a meeting in his office for the purpose of discussing routine and organization matters. In addition to Superintendent Sharp and his staff those present included C. A. Plumly, superintendent of telegraph, Baltimore and Ohio Railroad, and Mr. Plumly's chief clerk, R. F. Miller.

Bruce Beardsley, of the engineering department, has gone to the Hearts Content, Newfoundland, cable station on a business trip.

S. M. Barr, of the engineering department, is on a business trip to offices in Cleveland and Cincinnati, Ohio, and Chicago, Ill.

R. H. Underwood, of the Indianapolis, Ind., office, has been promoted to a position on the staff of the general manager, Lake Division, Chicago, in charge of the training of managers.

At the Annual Convention of the Association Western Union Employees, held at New Orleans, La., the week of September 20, Joseph P. Hayes, of San Francisco, Cal., was re-elected president, and James G. Hayes, of Chicago, re-elected general secretary and treasurer. Detroit, Mich., was selected as the place of meeting in 1921.

Twenty Officials, representing eighteen Western States, held a meeting in Denver, Colo., on September 14, at which various traffic subjects were discussed. A. C. Kaufman, general commercial agent, New York, addressed the meeting relative to cable traffic with South American countries.

E. W. Titus, manager of the New Albany, Ind.,

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office was notified on September 22, that his son, Major E. T. Titus, who has been stationed at Camp Grant, Ill., has been commissioned a major in the regular army.

New York Western Union

P. O. PURCELL, of the main operating room, has the sympathy of his friends in the death of his mother, which occurred on September 29. Interment was at Scranton, Pa.

JOSEPH HENRY, one of the veterans of the New York main office, and at one time Mayor of Hasbrouck Heights, N. J., died on October 2.

Cincinnati, Ohio, Western Union

GEORGE W. LAMPTON, of the Chicago office, spent his vacation with his son, who is in business in Cincinnati.

CHRISTY FLYNN, of this office, was transferred to the Youngstown, Ohio, office on October 2.

HARRY STANGLE, of the traffic department, has returned from his vacation, which he spent at points in the east, including Pittsburgh, New York and Baltimore.

JAMES PIGMAN, who has been away on account of illness for some time past, has returned to duty.

MESSRS. WIEDEMANN and THIERY, of the multiplex department, both away due to illness, are reported improving satisfactorily.

JOHN VAN HOOSE, of the operating department, died on September 30, his death being due to pneumonia.

EMPLOYEES of this office who have recently returned from the Cleveland office, where they have been helping out during the past few months, are: Misses K. McClure, D. McLarnen and F. Hofer.

ROSS SATER also has returned from the Cleveland office, this time bringing a bride with him.

Western Union Gulf Division

S. W. DE WOLF, general manager of the Texas, Mexico Railway was an official visitor at Dallas headquarters recently.

S. S. SCOTHORN, manager at Laredo, Texas, reports conditions on the border brighter than at any time during the past several years.

GUS SCHULTZ, manager at Galveston, Tex., visited the general offices, Dallas, recently.

J. C. SMITH, formerly superintendent in this division, was a Dallas visitor recently.

ROSCOE HOOPER, superintendent of telegraph, Kansas City Southern Railroad; H. C. Chace, superintendent of telegraph, Santa Fe Railroad; C. W. L. Mickley, superintendent of telegraph, International and Great Northern Railroad; J. Mathews, superintendent of telegraph, Gulf, Colorado and Santa Fe Railroad, and E. Richards, superintendent of Telegraph, Cotton Belt Railroad, were recent official visitors at the general offices, Dallas.

W. E. WASHBURN, formerly office manager at Dallas, Tex., has been appointed manager at Bartlesville, Okla., vice E. L. Miller. Mr. Miller has accepted a position with the Empire Oil and Gas Company.

T. A. DARLING, city superintendent, El Reno, Texas, has returned to duty from a well-earned vacation.

F. D. WARD, manager at Fort Smith, Ark., who has been ill in a hospital for some time, is convalescing and hopes to return to duty soon.

MANAGERIAL APPOINTMENTS RECENTLY ANnounced are: W. E. Horne, Harrison, Ark.; C. W. Jones, Guthrie, Okla.; Iris Lynch, Yale, Okla.; Mrs. M. E. Burks, Drumright, Okla.; Sophie Smith, Idabel, Okla.; W. H. Morris, Cleburne, Tex.; J. J. Bales, Monroe, La.; Jessie Johnson, Pharr, Tex.; E. E. Jernigan, Port Arthur, Tex.; W. D. Wilson, Sanderson, Tex.; Max Case, Sipe Springs, Tex.; M. C. Hunt, Gainesville, Tex.; C. B. Brigante, Jennings, La.; J. M. Rohrer, Lake Providence, La.; C. A. Lovett, Iowa Park, Tex.; A. R. Barber, De Ridder, La.; B. H. Middleton, Corpus Christi, Tex., vice C. J. Heath, transferred to Clinton, Iowa; W. H. Berryman, Sweetwater, Tex.; O. J. Sexton, Plainview, Tex.; J. W. Wooters, Abilene, Tex.; M. L. Presson, Childress, Tex.; R. J. Connally, Sulphur, Okla., and Alex Chacere, Eunice, La.

OBITUARY

Death of Joseph W. Stover

Colonel Joseph W. Stover, eighty-three years of age, who for twenty-nine years was president of the Gamewell Fire Alarm Telegraph Company of New Jersey, died on September 27 at his home in East Orange, N. J.

Colonel Stover's early work was with the telegraph companies. He was operator and manager in the service of the old United States Telegraph Company and the American Telegraph Company. During the Civil War he was in the military telegraph service.

ELVIN L. MCGREW, of Pittsburgh, Pa., general purchasing agent of the Standard Underground Cable Company for thirty years, and for the past two years president of the National Association of Purchasing Agents, died of heart failure at the Hotel Imperial, New York, on October 8. Interment was at Pittsburgh. At the time of his death Mr. McGrew was in New York on a business trip.

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RADIO TASTE RECEPTION

The Tongue Instead of the Ear Used to Detect Radio Telegraph Signals.

Abstract of a Paper Presented at the October 6, Meeting Of the Institute of Radio Engineers, New York.

By A. N. Goldsmith and Edw. T. Dickey

Introduction

Practically all reception of radio telegraphic signals of a practical nature which has been done up to the present time has been accomplished through the sense of hearing of the operator. Some slight amount may have been done by using the operator's sense of sight, but this has never been found sufficiently satisfactory to warrant its use in practice. It was suggested by Mr. Arthur A. Isbell, that under certain operating conditions, *i. e.,* in places where there is great interference due to exterior noises, as in the case of the operator on an airplane, there might be a certain advantage in employing the operator's sense of taste rather than his sense of hearing in receiving signals. The object of this paper is to describe some tests made to determine the feasibility of reception of radio telegraphic signals by the sense of taste.

Preliminary Tests Using Direct Current and 60-Cycle Alternating Current

The fact that a stinging taste sensation may be produced by placing the two wires of a low potential electric circuit on the tongue is well known. The first problem met with in investigating taste reception was to design a pair of electrodes which could be kept in the operator's mouth for a considerable length of time. It was, of course, necessary to choose for the metal of these electrodes some material which would not form injurious salts of the metal in the mouth of the operator. This limited the available metals to gold, platinum or silver. Because of the prohibited cost of the first two, silver was selected for use in these tests.

Two electrodes were made of sheet silver about 0.016 inch (0.04 cm.) thick, 0.5 inch (1.27 cm.) wide, and 2 inches (5.08 cm.) long. They were separated by a piece of insulating material about 0.25 inch (0.63 cm.) thick. It was intended that the tongue should be placed between the electrodes. Wires were brought from each electrode so that they might be connected to a source of potential.

A few tests were made to determine the best position, pressure, and size of contact for the electrodes. It was found that placing the tongue between the electrodes as originally intended did not give the most satisfactory results. For the tests using direct current and 60-cycle alternating current, it was found better to have the electrodes slipped over the upper front teeth rather than the tongue. In this way one contact touched the inner part of the upper lip, while the other could be conveniently touched by the tip of the tongue. All the taste sensation was then confined to the tip of the tongue, which was found to be by far the most sensitive region in the mouth. The electrode touching the upper lip acted merely as a means for connecting that side of the circuit to the mouth.

In later tests made when using signals from a buzzer source, and signals from an antenna, it was found that the arrangement of electrodes just described was apt to cause painful sensations in the operator's front teeth. In an effort to prevent this, another disposition of the electrodes was tried. This was to have the ends of both contacts touch the tip of the tongue. This arrangement was found to give very good results. It had been tried previously when using the direct current and 60-cycle alternating current sources of potential, but had been found unsatisfactory, probably because of the relatively higher current and lower potential values common to such sources.

In all cases the best pressure between tongue and electrodes was found to be a firm, but by no means heavy pressure.

The electrodes should be small and should be close together so as to confine the taste sensation to a small area of the tongue and thus concentrate it. Two pieces of number 16 silver wire 0.5 inch (1.27 cm.) long, separated about 0.125 in. (0.31 cm.) and partially imbedded in some insulating material would make very satisfactory electrodes for actual signal reception. The taste sensation should be obtained with the tip of the tongue, for this organ becomes increasingly insensitive toward its posterior portion.

Direct Current Circuit

In the d. c. tests, storage cells were used as the source of potential. The potentiometer was a 160-ohm sliding contact resistance connected as a potentiometer. The voltmeter had a range of 0-2 volts, and the milliammeter had a range of 0-1 milliampere.

Observations

The first test that was made was to determine the constant potential necessary to produce the least noticeable taste sensation. It is quite probable that this potential would vary with different individuals, and possibly with the same individual at different times. The value necessary for the observer was $V = 0.4$ volt. For this potential, the current through the tongue, as indicated by the milliammeter, was 0.01 milliampere. Tests were then made at higher potentials, the results obtained being as follows:

$V = 0.75$ volt. The tests made indicated that signaling would be impossible at this potential. The element of fatigue was strongly noticeable at this

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voltage. It was found that if the key were kept depressed for 5 seconds, it was impossible to detect the opening and closing of the key immediately after the continuous current period. In fact, it was generally necessary to rest for about 10 seconds before the opening and closing of the key could again be clearly noted. The current at this potential was about 0.02 milliampere. On first closing the key it is probable that the current was of the order of 0.1 milliampere for a short time. It fell quickly, however, to the lower value. This effect was probably due to the polarization phenomena which will be described later.

$V = 1.0$ volt. Using this potential it was found that the opening and closing of the key could be detected after an almost indefinite period of continuous current. It should be noted here that while it is stated that the opening and closing of the key could be noted, it was really only the closing that produced a noticeable sensation. With the potentials used up to this point, it was not possible to note the actual opening of the key by noticing the cessation of the taste sensation. The current at this potential was approximately 0.05 milliampere. On first closing the key it was probably about 0.2 milliampere.

$V = 1.5$ volts. Using this potential it was just possible to note the time of opening the key after a period of continuous current due to the cessation of the taste sensation. The current at this potential was approximately 0.1 milliampere. On first closing the key it was probably 0.2 milliampere. It would be possible to transmit signals very slowly (about 2 words per minute) at this potential.

$V = 2.0$ volts. The taste sensation obtained with this potential was considered sufficient for the practical transmission of signals. The probable speed of transmission would not be over 10 words per minute, and possibly not higher than 5 words per minute. The current at this potential was approximately 0.25 milliampere, and slightly higher than this on first closing the key.

Notes on Taste Sensations

It is proposed to give herein the physiological effect of this method of reception on the operator, and to discuss certain electro-chemical phenomena in connection with the mouth electrodes.

It was noted that the taste sensation was more pronounced on first closing the key than after the key had been held down for some time. This was probably due to fatigue of the taste nerves on continuous excitation, and also to a partial polarization of the cell formed in the mouth. This latter effect would cause a decrease in the current, and thus a weaker sensation of taste. The fact, noted before, that the current was apparently higher on first closing the key seems to indicate that polarization was the deciding factor in this phenomena. This leads to the suggestion that alternating current might give better results than direct current as the source of potential, as the former would be free from polarization effects. It was found that the positive mouth-electrode became blackened by a coating of oxide where the tongue made contact with it. As the other electrode did not become blackened at all, the nature of the polarization is clearly shown.

It will be remembered that in these preliminary tests one electrode made contact with the upper lip and the other was touched with the tongue. In the tests made so far, the latter had been connected to the positive pole of the battery. To determine whether the polarity of the tongue electrode would make any difference in the characteristics of the taste sensation, the polarity of the source of potential was reversed. It was found that the sensations were slightly less distinct when the negative pole was connected to the tongue electrode.

After this test the polarity of the electrodes was changed back to the original arrangement, and it was found that a much larger current now flowed in the mouth electrode circuit than had been obtained previously, using 2.0 volts potential. The current now obtained was 0.4 milliampere instead of the 0.25 milliampere previously recorded. On keeping the current on continuously it was found that the meter indicated a slow fall in the value of the current until the former value was approached. From this we conclude that the polarity of the electrodes had been reversed until the polarization of the cell in the mouth was such that it assisted the flow of current. After the current had flowed for a time, however, the polarity of the mouth cell became again reversed, and by opposing the battery potential, caused the value of the current to fall.

In connection with the increase in current just described, a peculiar effect on the sight of the operator was observed. On closing the key the operator noticed an effect which, at first, made him think that the lights in the room were flickering. On further investigation, however, it was noted that the apparent flicker of the lights occurred only when the key was closed. As nearly as could be determined, the effect of this relatively large current passing through the mouth was to cause the iris of the operator's eyes to contract momentarily, thus giving the effect of a flickering of the lights in the room. A slight effect of a similar nature was noted on opening the key.

In connection with the reading of signals by taste, it was noted that the greatest difficulty was experienced in reading dots which were immediately preceded by dashes. The letter "c" (—·—·) was especially difficult to receive for this reason.

Tests Using 60-Cycle Alternating Current

The source of potential used was a 110-volt, 60-cycle generator. The potential was impressed across a 160-ohm non-inductive resistance. As the potentials needed in these tests were of the order of 1 or 2 volts, a second resistance was shunted around a portion of the 160-ohm resistance unit. As there was no a. c. voltmeter available for this work, which could be used to measure 1 or 2 volts, the potential was measured by an a. c. voltmeter having a range of 0.50 volt, and the potential impressed on the mouth electrodes was calculated and found

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to be 15 volts. As the amount of current taken by the mouth electrode circuit was small (not more than 0.5 milliampere) and as great accuracy as to the value of the potential was not essential, this method gave a value which was sufficiently exact for our purpose. No attempt was made to measure the current in the mouth electrode circuit.

Tests were first made to determine the lowest alternating potential with which it was possible to obtained a taste sensation. This was found to be with approximately $V = 0.5$ volt.

$V = 1.0$ volt. Using this potential it was found possible to note the time of opening the key after a period of continuous current, by the cessation of the taste sensation. It would be possible to transmit signals very slowly at this potential. The definiteness of the signal in this case was about the same as that obtained using 1.5 volts d. c. It is hard to compare the two directly, for as will be described later, the nature of the taste is rather dissimilar for the two types of current.

$V = 1.5$ volts. The taste sensation obtained using this potential was considered satisfactory for practical transmission at a rate of 5 words per minute.

Higher speeds than this (10 words per minute) might possibly be obtained by using higher potentials. It is probable, however, that this increase in speed would be due to the operator's ability to read by muscular reaction instead of the sense of taste. As will be described later, this phenomenon of muscular reaction was quite noticeable at the higher potentials.

Notes on Taste Sensations

The taste sensation accompanying the use of an alternating current source of potential differed from that obtained using direct current in the following ways:

1.—The element of fatigue did not seem to be so noticeable when using a. c. This may have been due to a slight variation of the taste with the alternations.

2.—The taste sensations did not appear to be any stronger than those obtained using the same potential d. c. However, it is probable that at the peak of each wave a larger current flowed than was the case with the d. c. The lack of any polarization phenomena with a. c. would lead to the belief that a somewhat larger current would be passed. The taste sensation was more continuous in its intensity when using a. c. than when using d. c.

3.—Combined with the taste sensation was the natural muscular reflex common to a. c., which was felt as a trembling in the tongue. At the higher voltages this was more noticeable than at the lower voltage. At 0.15 volt it was almost unnoticeable. It is probable that this muscular reaction was the principal reason for the taste sensations seeming to be more continuous in intensity, with a. c. than with d. c.

The more continuous character of the taste sensation, combined with the slight muscular reaction obtained with a. c., made it possible to read signals, using a lower potential than was required with the d. c.

At higher potentials (2.0 to 3.0 volts) the same effect on the operator's eyes was noted that has been mentioned under the section on d. c. tests. As in the former case, the phenomenon was due to large values of current through the mouth electrode circuit. In the a. c. tests a slight difference in the effect was noted. The operator not only noted a quivering as long as the key was held down. It was also noted that, for the same potential, the effect on first closing the key was not so marked as with d. c.

Remarks on Signals Received Using 60-Cycle Alternating Current

The highest speed which the operator found it possible to receive by taste reception was 5 words per minute, and in order to do this it was necessary to become accustomed to this method of receiving, for it is quite dissimilar to audio-reception. It is possible that with sufficient practice an operator might be able to receive at a rate of 10 words per minute by taste reception. It is doubtful, however, if the speed could be increased much above that. The reason for this is what might be called the "lag" of the taste nerves. It has not been possible to determine whether this is due to an actual sluggishness in the nerves, or a mechanical inertia of the liquids in the mouth. It should be noted that a certain time is required for the chemicals which cause the taste sensation to form between the electrode and the tongue, and then that a further small period of time is necessary for them to be dissipated after the forming current has ceased.

Regardless of the exact nature of the phenomenon however, the fact is easily demonstrable that a fraction of a second elapses between the time the circuit is closed and the moment when the sensation of taste is first noted. Furthermore, a similar period may be noted after the current has ceased, when the taste sensation still persists. As nearly as could be ascertained, this time lag is from 0.25 to 0.5 a second. The effect of this is to slow down the permissible speed of signal transmission. It also necessitates a special type of sending. The dots and dashes must be of gerater length than in ordinary transmission, and the spaces between the dots and dashes of a single letter must be longer than usual. As a consequence, of course, the spaces between letters and words must be correspondingly increased. All of these requirements limit the possible speed of reception.

Calculations to Determine the Practicability of Taste Reception From an Energy Standpoint

To determine whether it would be possible to use the taste receiver for the reception of actual radio signals, calculations were made on the basis of the data obtained in the d. c. and a. c. tests, to ascertain if the amount of energy ordinarily available in a small receiving antenna could be sufficiently amplified to be used for taste reception.

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It has been found that the current in a 25-ohm antenna, necessary to produce unit audibility in the telephones, using a crystal detector, is 5 micro-amperes. As a basis for calculation, a signal giving an audibility of 1,000 was selected. The current in the antenna system for such a signal would be approximately 30 times that necessary for unit audibility, or 150×10^{-6} amperes.

In order to determine the voltage and energy amplification required to permit such a signal to be tasted, it was now necessary to ascertain the potential and energy available in the secondary or detector circuit.

Calculation showed that such a signal corresponded to an energy in the secondary circuit of approximately two-tenths of a micro-watt.

In the tests using direct current and 60-cycle alternating current it was found that about 2.0 volts potential was necessary for workable taste signals. The measurements made with d. c. indicated that this potential produced a current of about 0.25 milliampere in the mouth electrode circuit. In other words, the energy necessary for readable taste signals was about 500 micro-watts.

Comparing these values with those of the actual signal as found above, it is seen that the necessary voltage amplification is 50 times, and that the energy amplification is 2,500 times. As it is possible in practice to obtain voltage and energy amplifications of this order, there was justification for further investigation of the taste receiver, using actual signals as the source.

Tests Made With Radio Frequency Signals Using Signals From a Buzzer Source

It was decided to try signals from a buzzer source first, as these could be easily obtained and controlled.

The circuits were tuned to a wave length of approximately 600 meters. The detector used was a vacuum tube. The plate potential employed was 60 volts. The capacity of the grid condenser was 0.005 mf., and the leak resistance between the grid and the plus side of the filament battery was 500,000 ohms. The amplifier used was a two-stage transformer-coupled amplifier giving a total voltage amplification of 150 times. The transformer between the amplifier and the mouth electrodes will be described later. An omnigraph was used in the usual way in the buzzer circuit to produce signals.

It was found necessary to ground the plus terminal of the filament battery to prevent the amplifier from howling. The amplifier bulbs were lit from the same battery as the detector bulbs. Separate plate batteries were used, however.

It was necessary to place the buzzer circuit across the room from the detector and amplifier circuits, because when placed nearby, the buzzer induced strong audio frequency currents in the amplifier circuits. The inductance coil of the receiving circuit was coupled to the buzzer inductance, and twisted leads were run across to the receiver circuit.

In these tests, the electrodes were placed about 0.125 inch (0.3 cm.) apart and touched to the operator's tongue. This was found to give better results for the reception of radio frequency signals than the method employed in connection with the d. c. and a. c. tests.

Output Transformer

It was, of course, impossible to connect the taste electrodes across the output terminals of the amplifier as the d. c. plate current of the last amplifier bulb would then pass through the operator's tongue. It was, therefore, necessary, to find a suitable transformer so that only the audio frequency a. c. would be obtained in the taste electrode circuit.

In testing transformers the following facts were noted:

A step-down ratio of transformation was necessary from the last step of the amplifier to the taste electrodes.

In the detector circuit, or with only one stage of amplification, a 1-to-1 ratio was best. As would be expected, the higher the amplification, the greater the necessary lowering of the voltage for proper reception.

The requirements of the taste receiver seemed to necessitate the use of a power transformer, that is, one capable of handling considerable energy while acting as a potential transformer.

Observations

The coupling between the buzzer circuit and receiving circuit inductances was increased until a taste sensation was obtained which was of the proper strength for signaling. Measurements were then made of the audibility of the signal in the detector circuit by the usual shunted telephone method. In making the measurements a pair of Western Electric Company Type P-11 telephone receivers were used. These telephones have an impedance of 22,000 ohms at 500 cycles. A decade resistance box was used to shunt the telephones. It was found that the signal of the proper intensity after two stages of amplification to permit of reception by taste, had an audibility of 500 in the detector circuit.

It was thought that a possible increase in the intensity of the taste sensation might be brought about by tuning the mouth electrode circuit to the audio-frequency tone of the buzzer. Values of capacity from 0.05 mf. to 4.0 mf., were tried in series with the transformer winding and mouth electrodes. With a condenser of 1.0 mf. capacity in series, the taste sensation was of the same intensity as when no capacity was in the circuit. With all other values, however, the insertion of the condenser decreased the intensity.

Using Signals From an Antenna

For the purpose of receiving outside signals, an ordinary inductively coupled vacuum tube receiver was employed. The antenna used was a single wire, 150 feet high and 180 feet long. It was found necessary to use four stages of audio-frequency amplification in order to get taste sensations of the proper intensity. Two sets of two-

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stage transformer-coupled amplifiers were connected in cascade. By separating them about ten feet, it was possible to get rid of the howling tendency sufficiently for the purpose of taste reception, provided the operator, who was connected to one amplifier, did not go too near the other. The reason for needing a greater amplification in this test than in the tests using buzzer signals was probably that the antenna used had a very high resistance, and thus, although the voltage amplification obtained with a two-stage amplifier would have been sufficient, the actual energy available at the end of the second step was not sufficient for taste reception.

With four stages of amplification it was possible to get taste sensations from all signals, the audibility of which in the detector circuit was 500 or more. The higher the audibility of the signal, the stronger was the taste sensation produced. The strongest signal received had an audibility of 5,000 in the detector circuit. The taste sensations resulting from this signal were not strong enough to cause discomfort for the operator. Whether or not a signal might be obtained of sufficient intensity to cause discomfort to the operator, would depend on the amount of energy which the last stage of the amplifier could handle.

As the signals received were commercial messages, their speed prevented them from being read by taste reception, but the intensity was sufficient to permit of their having been read had the sending been slower. It was found possible to tune in a station by noting when the intensity of the taste sensation was greatest. It was also noted that a slight difference existed between the taste sensation produced by a 240-cycle spark transmitter and a 500-cycle spark transmitter. The difference was not sufficient to permit of one being received through the other, as could be done with audio-reception. It would be impossible to read through interference with the taste receiver unless one signal was quite strong and the other almost unnoticeable. Strong strays would probably cause signals to become unreadable.

From the point of view of electrical operation, taste reception is possible. It is possible to amplify sufficiently a signal having an audibility of 500 in the detector circuit, to cause it to produce taste sensations. It is possible to read signals by the sense of taste if they are sent at a slow speed (about 5 to 10 words per minute).

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

HOOKING UP WIRE AND WIRELESS TELEPHONE

Catalina Island, Thirty Miles Off California Coast, Now Connected With Los Angeles by Telephone

One of the earliest really serviceable radio telegraph installations was that set up about fifteen years ago between San Pedro, the port of Los Angeles, Cal., and Avalon, Santa Catalina Island, thirty-seven miles off the California coast.

Santa Catalina Island is a Mecca for tourists in search of semi-tropical atmosphere and charm. The marine gardens which may be viewed from small launches equipped with glass bottoms have for many years been an attraction which has lured California visitors by the thousands to tarry one more day in order to make the trip to the island.

Since the installation of the shore stations referred to the two steamers which make the daily trips to Avalon have been equipped with radio telegraph apparatus, and the passengers have at all times liberally patronized the service.

The permanent residents on the island, however, have not until recently had continuous means of communication with the mainland, except the message service by radio telegraph. This has now been remedied and radio telephone service is available throughout the day and night.

The work of hooking up by wire and wireless Catalina Island with the mainland was done by engineers of the Pacific Telephone and Telegraph Company.

First, a telephone toll switchboard was installed at Avalon to furnish local service on the island and to give the residents and merchants on the island direct access to the proposed toll service to California coast cities.

The project consisted of three parts: the wire line from Los Angeles toll board to the radio station on the coast—twenty-three miles away; the radio circuit from this station to the radio station on the island, and third, the connection between the island radio station and the Avalon telephone exchange.

Long Beach, on the California coast, and Pebbly Beach, on the island, were selected as the sites for the radio stations. At Long Beach the radio equipment is installed in the toll telephone office. At Pebbly Beach two small huts were constructed, one to house the transmitting apparatus and one for the receiving apparatus—the huts being about 100 feet apart. The distance between the Pebbly Beach radio station and the Avalon telephone exchange is one and one-quarter miles. The pole line between these points carries the talking circuit and the wires transmitting power for the operation of the radio transmitter.

Immediately after the opening of the through telephone service the traffic became in extent practically all the circuit can carry until two-way simultaneous service is established. To successfully care

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for the traffic what is known as the dispatch system is used. Applied to this unusual circuit the dispatch system requires two operators at each end of the circuit. The operators may be classified as dispatch operators and as toll operators. The dispatch operator passes the details of the telephone call over the circuit while the toll operators are calling the subscribers. When the subscribers at each end are prepared to talk the circuit is turned over to the toll operators, and when the conversation is completed the dispatch operators resume control.

Words transmitted from Avalon are carried over the wire line to Pebbly Beach radio station, where by means of a telephone repeater they are directly repeated into the radio telephone transmitter and reach the land line telephone apparatus at Long Beach through the radio aerial and a telephone repeater. Transmission in the opposite direction is by the reverse process.

Conversation has been carried on directly from the Avalon office to Portland, Oregon, using wire lines from Long Beach, Cal., to Portland. As is the usual experience in telephoning, the higher pitched tones of women's voices carry more clearly than the average male voice.

American Telephone and Telegraph Company Stock Ownership

That the ownership of the American Telephone and Telegraph Company is becoming more and more national and representative is shown by the latest analysis of the records of stockholders of the corporation. Not only are the proportions of stockholders in the various sections of the country becoming more equalized, but the proportion of small stockholders is increasing rapidly.

Of all American corporations this company is third in the amount of stock outstanding, but it is first in number of holders of common stock. Of the big corporations it has, perhaps, the widest distribution of ownership and the smallest average holdings per stockholder. There are now over 135,000 recorded owners of the company's stock and the average holdings are less than $3,300.

Another interesting development is the entrance in the last four years of a large body of employee stockholders. Under an easy payment plan which the company announced to employees January 1, 1915, and an extension to this plan, in March, 1916, over 23,400 of those purchasing shares continue to hold stock. On December 1, 1919, a new offer of stock was made under which any employee of at least one year's service could purchase a limited number of shares, paying for them at the rate of $3 per share per month. This offer has proved very popular; 46,126 employees in August, 1920, were making payments on 184,580 shares, an average of four shares each.

It is probable that 25 per cent. of the stockholders will be employees and 25 per cent. of the employees will be stockholders, when the employees now purchasing stock finish paying their installments.

Canadian Marconi Company

The Board of Railway Commissioners passed order 30,063, September 3, approving the Marconi Wireless Telegraph Company's conditions governing the acceptance of messages for the United Kingdom. It is provided that unless otherwise stated a message sent is to be an unrepeated one, and if a repeated one, an extra charge of quarter the rate will be made. The company and its connections are absolved from liability for mistakes or delays in transmission or delivery, and for non-delivery of unrepeated messages beyond the amount of tolls collected for transmission, and also from liability for delay or non-delivery of a repeated message beyond 50 times the amount collected for repeating, and for delays arising from unavoidable interruptions in the service, and from errors in cipher or obscure messages. No responsibility attaches to the company concerning any message until it is accepted at the transmission office, and if the company's messengers are used for this purpose they act in that capacity as agents of the sender. Claims for damages or statutory penalties must be presented to the company within 60 days after the message is filed for transmission, or the company's liability ceases.—*Canadian Railway and Marine World.*

Canadian Marconi and Canadian General Electric Co. Consolidation

The recent consolidation of radio interests of the Radio Corporation of America and the General Electric Company, in the United States, has been followed by a merger between the Marconi Wireless Telegraph Company of Canada and the Canadian General Electric Company—a separate company from the American General Electric Company.

The officers and directors of the new organization are: Frederic Nicholls, president; William Marconi, A. E. Dyment and Robert Bickerdike, vice-presidents; A. H. Morse, managing director, and, on the Board: Sir William MacKenzie, Godfrey C. Isaacs, G. M. Bosworth and C. G. Greenshields. Messrs. Nicholls, MacKenzie and Dyment are directors of the Canadian General Electric Company.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

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SEMI-AUTOMATIC MORSE TRANSMITTERS

Adjustment and Operation

At the Winnipeg convention of the Telegraph and Telephone Section of the American Railway Association, held on September 22, 23 and 24, Committee No. 6, Message Traffic, H. Hulatt, chairman, in a report which included a number of constructive recommendations, had the following to say in regard to the operation and adjustment of semi-automatic Morse transmitters:

After carefully going over the answers to a questionnaire sent out by the general secretary of the American Railroad Association to various telegraph superintendents, who are using the semi-automatic keys successfully, we find that on any workable circuit, semi-automatic keys in good condition, properly adjusted and competently handled, should transmit readable signals without changing the adjustment except to regulate the speed. However, the excellent work done by a majority of operators using semi-automatic sending keys is more or less obscured by the poor work of those who attempt to use the keys before acquiring the proficiency necessary to transmit the business reliably.

Therefore, the committee believes that the Division should adopt as recommended practice for the mechanical and electrical adjustment of semi-automatic keys, the instructions embodied in traffic circular No. 44, issued by the Western Union Telegraph Company under date of July 23, 1915, which reads as follows:

"The results obtained by a series of sending-machine tests warrant the following conclusions:

1. UTILITY OF SENDING-MACHINES—A sending-machine in good condition, properly adjusted and competently handled, will carry reliably on all workable circuits without the changing of any adjustments save that which regulates the speed.

2. A GENERAL PRINCIPLE—Changing the rate of vibration varies the lengths of both dot and space proportionately, while changing the relation of the dot-contact points increases one at the expense of the other. (In this statement the word "space" refers to the spaces mechanically made by the machine in a stream of dots.)

3. LIGHT SIGNALS—If a receiving operator states that the signals are light, and the circuit cannot be improved, the remedy is to lengthen the dots by reducing the speed of vibration, not to change the relation of the dot-contact points.

4. HEAVY SIGNALS—If a receiving operator states that the signals are too heavy, and the circuit cannot be improved, the remedy is identically the same as in (3), namely, reducing the speed of vibration, as that will increase the length of the spaces.

(Paragraphs 3 and 4 pre-suppose the sending-machine to have been adjusted according to the methods hereinafter described.)

EXAMINATION AND ADJUSTMENT

The adjustments of semi-automatic keys are both mechanical and electrical, and the examinations should be made in that order.

MECHANICAL EXAMINATION AND ADJUSTMENT

1. PRELIMINARY INSPECTION—See that both the dot and the dash contact posts are rigid, that the cord is sound, and so attached to the binding posts that a pull on the cord is not a direct pull on the exposed parts of the wire.

2. SPRINGS AND LEVER ACTION—See that the springs are neither too weak to act nor too strong for comfort, and that the lever is not held too tightly by the trunion screw. The lever should move easily, yet without wobbling.

3. CONTACT POINTS—File both the dot and the dash contacts smooth, and make the contact surfaces parallel when they meet.

4. ADJUSTMENT OF DOT-CONTACTS—Turn the top-screw on the same side of the machine as the deadener till the reed rests against the deadener without pressure. Clamp the stop-screw. With the reed in this position, the distance between the dot-contacts should be one-sixteenth of an inch. If it is not, turn the dot-contact screw until it is, then clamp the screw.

Now, by means of the other stop-screw, *i. e.*, the one on the same side of the machine as the stationary dot-contact post, move the reed until the two dot-contacts meet squarely but without pressure. Clamp the top-screw. After the clamping, see that the two dot-contacts meet without pressure when the reed is moved slowly by the handle.

This adjustment may be slightly modified by the succeeding operations, but this modification has been taken into account in the instructions just given.

ELECTRICAL EXAMINATION AND ADJUSTMENT

1. RESISTANCE OF MACHINE AND CORD—Measure the resistance of machine and cord, first, through the switch; second, through the dash-contacts; third, through the dot-contacts when the two points are pressed together by the hand. The total resistance in all cases should be less than one ohm.

2. MIL-AMMETER ADJUSTMENT—Place the machine in series wth the mil-ammeter and one 150-ohm relay on a local circuit with a current of between 40 and 60 milliamperes. A way circuit will not do. Be sure that the machine rests on a horizontal base.

Make groups of six dots each at a moderate rate of vibration, allowing time between the groups to permit the needle to return to zero. By "moderate" rate of vibration is meant a speed corresponding to that of a hand-sender, sending about thirty-five

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messages an hour. Neither a high rate of vibration nor a low rate will give the best results.

The highest milliammeter reading for each group of six dots should be two milliamperes less than one-half the reading on closed key. If this is not the case with the instrument being tested, turn the dot-contact screw until this reading is obtained, then clamp the screw. Repeat the dotting process to make certain that after the clamping the position of the dot-contact point was not changed.

SUMMARY—When the reed rests against the deadener, the distance between the dot-contact points should be one-sixteenth of an inch, and when a group of six dots is made, the highest milliammeter reading should be two milliamperes less than one-half the reading on closed key.

Note—The distance between the dash-contacts does not affect the carrying power of the machine. It may be just sufficient to enable one to see clearly between them. One sixty-fourth of an inch is ample.

APPROXIMATE ADJUSTMENT—An approximately accurate adjustment may be obtained by the mechanical examination and adjustments without the electrical measurements.

The committee feels also that the following comments and conclusions based on observations and tests will be beneficial to those charged with supervision and the education of operators in the use of semi-automatic keys:

The electrical impulse which closes the reading circuit is called "Marking," and the impulse which opens it is called "Spacing." Perfect signals, as from a Wheatstone transmitter, registered on tape when dots are transmitted, will show fifty per cent. "marking" and fifty per cent. "spacing," *i. e.*, the length of the dot characters (marking) and the distance between the dot characters (spacing) on the tape, will be equal.

Hand-sending is biased toward spacing and what is known as perfect Morse will be found to register sixty to seventy per cent. spacing; hand sending that approximates the equal division of marking and spacing sounds sluggish or "muddy" on unrepeatered wires, but carries well on long-distance repeatered circuits. Hand-sending that is more than ordinarily biased toward spacing sounds "light" on unrepeatered wires and fails to carry through repeaters, dropping out, especially on final dots.

Operators changing from hand to semi-automatic key sending, maintain the same proportion between marking and spacing and the quicker action of the semi-automatic key accentuates the bias. The light sending fault, usually ascribed to improper adjustment of the key, or poor judgment on the part of the sender, is not properly chargeable to either unless the operator has been told where the fault lies and given assistance in correcting it.

Managers, wire chiefs and division operators should be educated to watch for this fault and to assist the operators in correctly gauging the proportions of marking and spacing in their sending, whether hand or machine. Periodical examination and adjustment of semi-automatic keys should be made. The manager of the office keeping a book record showing the date the keys are examined and their condition, which record should be examined regularly by the telegraph department supervisory forces.

The committee believes that a close co-operation between managers, wire chiefs and division operators in insisting upon the proper mechanical and electrical adjustment of all semi-automatic keys and training operators in their careful use, will bring about a high standard of proficiency.

The committee recommends also that the manufacturers of semi-automatic keys be required to use stranded wire cord instead of the tinsel cord now being used for the reason that tinsel cords after wear frequently contain a variable resistance before the circuit is broken entirely. This variable resistance causes faulty signals sometimes charged to line or apparatus trouble. It is also suggested that the manufacturers' attention be directed to the importance of a uniform tension in all reed springs as it has been found that the reeds vary to an extent that operators in some cases use two and three governing weights to regulate the tension.

It is recommended also that the wedge plugs on cords be made of uniform thickness to fit between the lip and base of keys without damage to the lip.

Increased Taxes for Telephones and Telegrams in Jugoslavia

According to the decision of the Ministry of Posts and Telegraphs, the rates for telegrams for the interior of Jugoslavia will be increased from 10 paras per word to 20 paras per word. The minimum charge is fixed at 2 dinars (1 dinar = 100 paras = $0.193, normal exchange).

Subscriptions for telephones at Belgrade, Sarajevo, Zagreb, Ljubljana, and other cities, beginning with July 1, 1920, will be as follows: (a) For hotels, cafes, industrial plants, factories, commercial firms, commercial agencies, law offices, stores, and all places serving for public reunions, 500 dinars per year. (b) For newspaper editorial rooms, private apartments, state and official offices, 300 dinars per year. (c) For telephones installed in residences of public functionaries, 200 dinars per year.

In smaller localities, where the number of subscribers does not exceed 100, the charges are: For categories *a*, 300 dinars, and for categories *b* and *c*, 200 dinars per year.

THE OLD WIRE CHIEF SAYS: "The difference between a desired ideal existence and inevitable experience is about the same as the difference between an oil painting and a tintype. In one may be portrayed only what is beautiful and pleasing, while in the other the camera records all within its view—the beautiful, the ugly, the good and the bad."

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SIGNALS

A Short History of Primitive Methods of Visual Signaling

When, where, and by whom signals were invented are questions which cannot be answered here. Signs are made by animals, and human signs are understood by them, but signals—that is another matter.

The word trails off into the geological past with misty suggestions. Yet it has a more or less definite connotation. He who signals communicates with another who is beyond the range of the human voice or at a time when it is inadvisable to employ the ordinary means of verbal communication. Hence it is not surprising that the word "signal" is associated in our minds with the unusual, the novel, the dangerous; and as a matter of fact its established uses are those of warfare, although signals have been employed for many other purposes.

The element of secrecy is also inseparable from the thought of a signal. Thus the ringing of a church bell calls the worshippers together, but it is not a true signal, though it has often been converted into one in time of danger. For a true signal does not take the public into its confidence; it is designed only for the select few who are aware of its specific purpose and who can interpret the sense symbol. Even a warning signal which renders some dangerous piece of machinery "foolproof" is not a message to people in general, but rather to those who rashly court the destruction that lies in whirling steel.

Judged by these and other requirements, the first military signals, which are said to have been made by the human voice, doubtless proved a very untrustworthy means of transmitting orders and other intelligence. To say nothing of contrary winds and "thick weather," the word of mouth message, projected from sentinel to sentinel over hundreds of miles, must often have arrived at its destination in a curiously distorted form. Yet by these means Xerxes established a line of communication from Greece to Susa, sending messages at the rate of 480 miles in two days, and by the same method the news of the massacre of the Romans at Orleans was brought to Auvergne between sunrise and sunset, the distance being one hundred and twenty miles. Such crude methods of communication do not properly constitute signaling, which requires for secrecy the translation and interpretation of the message by a code or a system of signs agreed upon by the sender and those with whom he communicates. And the same may be said of all direct methods of transmitting information verbally or by writing, both ancient and modern, whether the medium employed be a carrier pigeon, a balloon bomb with its concealed letter, or the wireless telephone.

But true signals all peoples seem to have had, and one of the simplest for use by night was the beacon. By fires kindled upon mountain tops the news of the fall of Troy was brought to Clytemnestra, wife of King Agamemnon, and by the same reliable method the coming of the terrible Saracen was announced at Constantinople where the last in the chain of fires which had blazed across Asia Minor was lighted in the imperial pharos of the great city. At the expense of the royal treasury, or in obedience to the imperial order, fires were maintained upon the principal headlands of the Roman provinces that the royal triremes might navigate in safety and the shipping interests of the imperial city be conserved. By a sign of fire set up in Bethhaccerem the children of the tribe of Benjamin were warned by Jeremiah to flee out of the midst of Jerusalem, and in the Bible there occur many other references to the beacon, which was frequently employed by the Hebrews, Persians and other ancient peoples. Beacon fires, too, announced the approach of the famous Spanish armada, and in America, during the Revolution, a line of such fire signals was maintained across New England and the Hudson Highlands to New Jersey and Pennsylvania. Earlier still the beacon had been used to warn the colonists of the approach of hostile Indians, and from one of these beacons, established as a signal in Boston five years after the founding of the city, Beacon Hill derives its name.

Nearest of kin to the beacon is the torch, which, because of its mobility, possesses the true elements of the signal. The Romans used it as a signal of attack, which was given by the priests of Ares, who threw lighted torches in front of the foremost ranks as a sign that the advance was to be made. But there is also evidence that torches played an important part in the system of long-distance signaling, invented, so it is said, by the Greek philosopher, Democritus, but improved and made matter of historical record by the general, Polybius. The apparatus at each signal station consisted of five upright posts and a screen or fence at each end of the row of posts. Behind these screens were kept ten lighted torches, and upon the posts were arranged across five columns the letters of the Greek alphabet.

At each station were fixed two tubes, so placed that by looking through the left-hand tube only the corresponding fence at the next station could be seen, while by the right hand tube the opposite fence was visible. Signals were made by raising above the left-hand fence one or more torches to correspond with the number of the column to be read at the next station, while the letters were indicated by torches shown at the right-hand fence.

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Thus the letter C would be indicated by three torches to the left and one to the right, O by five torches to the left and three to the right, M by three to the left, and three to the right, and E by five to the left and one to the right. By this somewhat laborious means of communication a considerable amount of time would be consumed in spelling the word *come* (or its Greek equivalent), and the method, though flexible enough, since no code was required, must often have proved impracticable. The device constituted, nevertheless, a true system of signaling by night, and it was extensively employed by the Greeks, who, in connection with their armies, had special signal corps trained in its use. In the early part of the nineteenth century it was revived in altered form by an English clergyman, who used pauses between the flashes for posts and letters, and transmitted messages with a single torch a distance of forty miles.

Quite as complicated as this system of signaling described by Polybius were the day signals, whose existence is vouched for by Æneas, writing about the year 360 B. C. The materials consisted of earthenware cylinders, four or five feet high and a foot and a half in diameter. Upon a stick, which fitted into a cork of smaller diameter than the cylinder, were cut or marked the characters which corresponded to the messages of a prearranged code, and the receptacles were so constructed that with a given amount of water in each of them identical characters would be read from the sticks at the top of the cylinders. When a message was to be sent from one station to another, a fire signal was given, signifying that water was to be let out of the vessel at the receiving station, while a second signal indicated that the flow of water was to be stopped. The character which then appeared at the rim of the cylinder at the receiving station indicated, when translated from the code, the message which had been sent.

Among the ancients, who left little record of signaling by day, prearranged messages were sometimes conveyed by flags, banners and shields, the last being used, it is supposed, after the manner of the heliograph to reflect the sun's rays. Standards elevated or depressed, or borne in other positions, regulated the movements of the Roman troops, but apparently methods of flag signaling over long distances were unknown. In fact, in the matter of daylight signaling the American Indian, who utilized his camp fire as a means of transmitting messages to distant friends, displayed greater ingenuity than the civilized Greek or Roman. By the simple expedient of blanketing and quickly uncovering his fire he would expel from it rings of smoke which, when read by code, constituted a message visible at a distance of more than twenty miles. According to the usual code, one smoke ring signified "danger," two smokes "a camp here," while three smokes from fires built close together conveyed a warning. Better still by night was the Indian's fiery arrow, made by coating the head with gunpowder and powdered bark, the message conveyed by its fiery line informing friendly Indians of the situation. Its modern substitute is the rocket, while the smoke cloud also survives as an important method of signaling in modern warfare. Smoke clouds, consisting of fine black dust, may be produced by turning the exhaust of a motor into a vessel containing lampblack, and by lengthening or shortening the puff may be adapted to the Morse code, as shown some years ago by James Means, an American inventor living in Boston.

The Means method has been used by the French, and similar modes of signaling have been employed during the recent war for transmitting messages from aeroplanes. But the difficulty of carrying the apparatus sets limits the usefulness of this method of transmitting military intelligence.

Signaling and the apparatus of signaling are quite as much as language itself, the result of a process of development. Theoretically, any of the senses might serve as a medium for the transmission of secret information, but the use of tastes and odors for this purpose is confined chiefly to fairy-lore and other fiction, sight and hearing being the only senses which are practically available. Hence the usual classifications of signals as visual and auditory.

Of these, without doubt, the visual signal is the more important, although the range of auditory signaling was greatly increased by the introduction of cannon and the invention of the fog horn, siren and whistle. In modern aerial warfare the auditory signal is frequently resorted to, the source of the sound being the engine of the aeroplane, and the interruptions necessary to secure the time intervals which adapt the message to code being produced by means of a switch. The only important advantage which the auditory signal can claim over the visual is its adaptability to adverse weather conditions, but, while by the use of a code secrecy may be secured, the range of sound is limited and in time of battle the booming of cannon is a disturbing factor.

Importance of the Semaphore

Among visual signals for use either by day or by night, the semaphore has long occupied a position of trust and importance. In its simplest—and perhaps aboriginal—form, as found among the Eskimos, who require no other apparatus than that provided by nature, it consists of the signalman himself with one or both arms laterally extended at angles required by the message of his code. Standing upon a hill, where his movements are plainly visible at a distance, and with his body facing the observer, he signals his message, "Come here," by moving his right arm upward and downward, while by a similar movement of the left arm he signifies that those indispensable carriers, the Eskimo dogs, must be brought. By other signs this human semaphore transmits the information that deer are to be found in his locality, and in the sign language of the frozen north he may relate the story of their capture.

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Probably the semaphore, which has played so great a part in naval, and to a less extent in army, signaling, had its origin in such a natural adaptation of the language of gesture to distant communication. But its history is obscure, and when, after the middle ages, the semaphore was introduced into Europe, its use, like that of spectacles, telescopes and other inventions which extended the range of the senses, was opposed on religious grounds. In principle it consists of an upright beam of varying length, with a cross-beam turning on a pivot and bearing at each end a smaller beam, capable, like the first, of being rotated through various positions. The semaphore was adapted to naval and railroad signaling by night by hanging lanterns from the arms, thus indicating their position. On shipboard the instrument was sometimes set up on the deck and sometimes fixed at the masthead.

The British Admiralty adopted the semaphore from the French and in the same year that M. Chaffé brought out his invention Lord George Murray's shutter telegraph appeared. It consisted of six shutters working upon a central pivot. By exhibiting the flat side of the shutter or presenting the edge (thus concealing the shutter) code messages could be given. During the Napoleonic wars this method of signaling was employed, and it is stated that as a record performance messages were sent from Plymouth to London in ten or twelve minutes, although in 1806, in the year that this was accomplished, these places were separated by a three days' journey. However, the shutter telegraph gave place to the semaphore, which in turn yielded on the last day of 1847 to the superiority of the telegraph.

As the fate of armies has often depended upon the speedy and accurate transmission of a message, it is strange that signaling received so little attention until the seventeenth century was nearly spent. To be sure, guns and lanterns by night, and by day flags displayed in various parts of the ship had, in naval manoeuvers, served to transmit orders, but no approach to genuine serviceability was attained until, in 1780, Admiral Kempenfeldt produced his code book with flags and messages upon opposite pages. A few years later improvement was made by numbering the flags from 1 to 10. It was found that by this means no less than 310 messages could be sent by the admiral to his fleet, although the number of possible responses was more limited. Then, with the beginning of the nineteenth century, the system of Admiral Sir Home Popham, which, by making use of lettered flags in pairs, provided for the sending of messages not prearranged, was adopted in the British Navy, and it is with this system that Lord Nelson signaled to his ships the words that have since fired the hearts of many Englishmen: "England expects every man to do his duty."

In the Navy, conditions permit the use of many flags of various colors, their color and position one above another indicating the message of the code book, while for signaling at distances too great for colors to be distinguished the message is conveyed by the shape and position of the flags. Flag signaling in the army is to a much greater extent dependent upon motion, as seen in the wig-wag system. By waving a flag to the right and to the left any desired combination of the numbers 1 and 2 may be signaled, the numbers corresponding to letters.

But one of the most effective forms of signaling is yet to be mentioned. That it possesses the merit of extraordinary secrecy is known to every schoolboy who has profited by the fun-producing properties of a small pocket mirror to dispel the gloom of study hours. Rapidity of operation, portability and range are other properties which have made the heliograph one of the best instruments for signaling that has ever been devised. It consists of a small mirror carried on the end of a bar, which is mounted on a tripod, and it is so operated by means of a key, which throws the mirror out of alignment that light may be reflected upon a second mirror at the opposite station. The light rays are directed as a rifle provided with a peep-sight would be aimed, a small unsilvered spot in the centre of the mirror serving instead of the rear sight and the sighting bar taking the place of the rifle barrel. The sighting of the instrument is not complete until by the use of slow motion screws the mirror has been so turned that its unsilvered portion has cast a "shadow spot" upon the exact centre of a disk carried by the sighting rod. When this is accomplished the flash is visible at the receiving station.

The secrecy of the heliograph message is insured by the fact that at a distance of one mile the circle of illumination caused by the flash is only 16 2-3 yards in diameter, the diameter increasing with each mile by the same amount. The extreme range of the heliograph, being limited only by the convexity of the earth, is asserted to be, under favorable conditions, from ninety to one hundred miles, but messages have been transmitted by its means over longer distances, notably that sent by Capt. Gassford, of the United States Signal Corps, between Mt. Uncompaghre, in Colorado, and Mt. Ellen, in Utah, the distance being 183 miles. In all recent wars it has played an important part, and it is said that in the Boer War the British placed chief reliance upon this mode of signaling. In 1880 it effected the release of the besieged garrison of Kandahar, which for several hours carried on communication with Lord Roberts' relieving force over the heads of the enemy. Recent modifications have been made, but the principle of the heliograph, known also to the Indian, who with his mirror flashes messages from hill to hill, remains the same.—*The Edison Monthly.*

THE OLD WIRE CHIEF SAYS: "The kind of millenium we all should hope for would be a time when everyone clearly realized that living a life of continually trying to 'get something for nothing' is a disgraceful objective."

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Leaders in Engineering Circles United to Study Electrical Insulation Problems

The National Research Council has entered into an extensive campaign to investigate the principles of insulation, a matter which is of vital importance to the electrical trade and to its consumers. A meeting of the Council's Insulation Committee was held recently at the laboratories of the Western Electric Company at 463 West Street, New York. It was attended by nearly twoscore of the most prominent engineers in the country. The chief engineer of the Western Electric Company, Dr. F. B. Jewett, who is chairman of the committee, presided.

The National Research Council for some time past has been endeavoring to formulate a practical plan whereby co-operation between the universities, the industries and the National Research Council might be accomplished in attacking the problems involved in fundamental research upon insulating materials. The basic properties of insulating materials are not well understood. Just what are the things that make an insulating material serve its function of insulating things electrically are not known. In order to arrive at an understanding of why an insulator insulates, because of the tremendous magnitude of the problems involved, co-operative research seems necessary.

A preliminary meeting of this committee was held a year ago. At that time no definite plans were formulated that seemed feasible as methods of attack. At this meeting, however, it was decided that the first step is the gathering together of all the published and known scientific material relating to insulation. This is a tremendous undertaking, and the committee decided that a permanent salaried secretary should be engaged to carry on the compilation of the material which has already been published and to maintain continuity in the records and activities of the committee. The committee also decided that it would attack the technical problems by providing some research men in the universities with funds and materials supplied by the industries, under the guidance of the National Research Council.

The scarcity of skilled and trained research men who are capable of attacking these recondite insulation problems, is a matter of much concern to the insulation committee. An effort will be made to discover among the post-graduate students and the faculties of the universities, men who are able to do this work. The benefits to the electrical industry, if these questions are given satisfactory answer, will in all probability be so great that a measure of them in financial terms at this time would be extremely difficult. In fact, if made in terms of the vision of these far-seeing men, they would seem extravagant and altogether unbelievable.

The committee consists of thirty-seven representatives from the electrical industries, the national engineering societies, the national scientific societies, the national manufacturing organizations and the universities and colleges of the country. Among those who attended the meeting were: C. E. Skinner, Westinghouse Electric & Manufacturing Co.; Dr. Irving Langmuir, General Electrical Co.; Percy H. Thomas, consulting electrical engineer, New York; William A. Del Mar, New York; D. W. Roper, Commonwealth Edison Co., Chicago, Ill.; Dr. Clayton H. Sharp, Electrical Testing Laboratories, New York; Dr. John Johnston, Yale University; Prof. Frederick Bedell, Cornell University; Prof. A. E. Kennelly, Massachusetts Institute of Technology; Prof. K. T. Compton, Princeton University; Edward D. Adams, Engineering Foundation, New York; Dr. Carl Herling, consulting engineer, Philadelphia, Pa.; John M. Weiss, The Barrett Company, New York; Dr. Richard C. Tolman, Chemical Division, National Research Council, Washington, D. C., and Dr. F. B. Silsbee, Bureau of Standards, Washington, D. C.

Increase in Telephone Rates

The Merchants' Association, of New York, is advocating an increase in the rates of the New York Telephone Company sufficient to enable the company to become once more self-supporting. From a study made of the telephone situation by the Association's Committee on Public Utilities, it appears that net earnings vanished last July as a result of an increase of nearly 40 per cent. in operating expenses.

It is, of course, absurd to expect a public utility to render service at a loss.

The affairs of the telephone company were disarranged by the devastating influence of government control during the war.

On top of this interference, a heavy burden of increased expense has been imposed. The shortage of equipment, which it was impossible to supply during the war, has proved a serious handicap which has been felt by the entire public. To provide this equipment now will require a heavy expenditure. In addition, the ordinary costs of operation have been largely increased.

Instead of being able to rely upon an income sufficient to meet these demands, the company finds itself with a deficit.

The users of the telephone lines have no wish to be unfair toward the company. While they object to paying more than is necessary for the services rendered, they do not expect this service to be furnished at a loss. The application of the company for an increase in its rates which is now pending before the Public Service Commission for the Second District, should have a prompt hearing and a fair decision.—*Greater New York,* Oct. 18.

IN AUSTRALIA, on a Wheatstone circuit between the cities of Sydney and Melbourne, with Gulstad relay repeaters at Wagga and Armidale, a speed of 180 words per minute is obtained.

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EDITORIAL COMMENT

Foreign Telegraph Visitors

The large operating rooms throughout the country are visited monthly by telegraph or telephone engineers from foreign countries, and although this has been going on for many years, it would seem that what we have to show has not yet been viewed by all foreign departments aiming at improvement in their methods of electric communication. At the present time, aside from the delegates from foreign countries in attendance at the International Communications Conference, there are thirty or more representatives from the telegraph, telephone or radio departments of foreign governments in this country investigating American systems and methods. Most of these men are comparatively young in years, and all are engineers engaged in construction or operation in their home countries—seldom are we visited by communication executives bent upon negotiating traffic agreements or studying our financial underpinning.

In the reverse direction of travel it may be said that rarely is an American telegraph engineer sent abroad to see what other countries may have that would be of value if introduced in service here, while our executives engaged in perfecting interchange of traffic arrangements with foreign departments are regular visitors to other shores.

At first consideration it might appear that we are confident that from the technical or scientific viewpoint people in other lands engaged in communication work could have nothing of value to show us which has not already been thought of and improved upon here.

If this is the general feeling, it surely constitutes an overlooked tribute to the progressiveness of American engineers.

It may be, of course, that this is not the true reason accounting for the difference in objective of those who travel. It is possible that the conditions cited are a result of the difference in the two systems of management—on one hand private ownership and on the other, governmental operation.

Consider, for instance, the event of a group of manufacturers from Czecho-Slovakia visiting the United States. Here they make use of the telegraph and telephone and conditions may be such that they are given excellent service. Upon opportunity they make inquiries as to how such remarkable service is accomplished, and, becoming confused with detail, resolve to bring it about that the telegraph authorities in Czecho-Slovakia forthwith dispatch a man to the United States to gather expert data. The Director of Posts himself is too busy to come; so is his assistant. Anyway, neither of these officials would be the right man—neither of them would bring home the complete story, and as a result a bright young engineer is detailed to the task. He comes. He returns. And the home service soon responds to the introduction of new wrinkles here and there.

So far as our engineers are concerned, they have a degree of opportunity when the foreign investigator is in their midst. An occasional question brings to light schemes practiced abroad which have possibilities here. The foreign engineer brings us what he has and takes away with him what we have to offer in the way of suggestion. This costs us little.

It may be true that in comparison with American telegraph service the service in most foreign countries is inferior, but the fact that traffic is not handled expeditiously is not necessarily a standing charge against foreign engineers. It is quite likely that they have developed and have available numerous apparatus and circuit improvements which are not being employed efficiently by State employees, and which in the hands of American traffic engineers would strengthen weak spots here and there on American lines.

However, if trips of investigation to other countries are all American engineers are missing by being under a system of private onwership, grievances on this score will be few. Our men will continue to develop new things in sufficient quantity to make it worth while for foreign engineers to visit us regularly.

By Radio Only

The extension of radio telegraphy is bringing to many places in the world a means of communication which removes the condition of isolation. Throughout the oceans there are many island communities which until recently have been without telegraph communication to neighboring islands and to continental cities.

The yearly issues of tariff books by the telegraph and submarine cable companies show additional points which may be reached by submarine cable aided by a radio link. Among the many places now listed are the following: Riberalta, Bolivia—radio from Lima, Peru; Punta Arenas, Chili—by radio from Valparaiso; New Caledonia—by radio from Brisbane, Australia; Papeete, Tahiti Island—by radio from Honolulu; Derna, Tripoli—by radio from Guelimich; Navassa Island, West Indies—by radio from Guantanamo; Tobago, West Indies—by radio from Trinidad.

In South America there are some thirty important centers reached by radio extensions from cable stations, and in all parts of the world the opening of additional radio stations adds to the number of places which may be reached promptly by wire and wireless.

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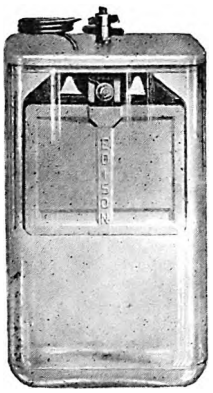
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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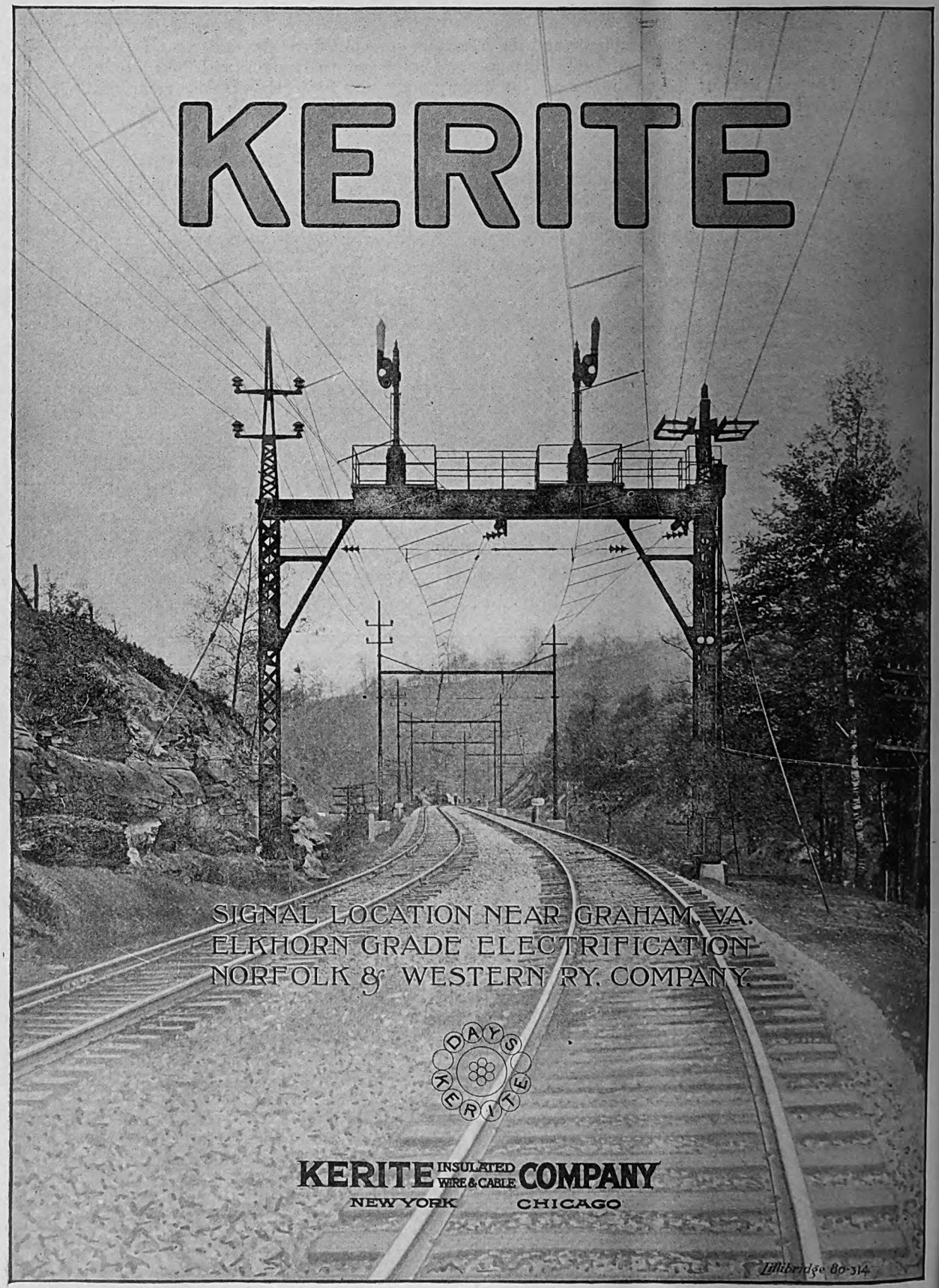

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THE RAILROAD
TELEGRAPH AND TELEPHONE

Committee No. 5, Telegraph and Telephone Development, for the coming year consists of the following members: J. A. Jones, chairman, and C. U. Jellison, A. C. Barfield, W. P. Cline, J. L. Henritzy, B. A. Kaiser, D. McNicol, W. Marshall, D. M. Post, David Sarnoff, R. R. Stackpole and W. F. Williams.

Chairman Jones is calling for technical contributions from the committee members to be considered for incorporation in the next report of the committee to be compiled before January 1, next.

J. D. JONES, chairman of Committee No. 12, Telegraph and Telephone Section, American Railway Association, has called a meeting of the members of the committee for November 3, to be held in room 200, Pennsylvania Depot, New York. The subject covered by this committee is "Radio and Wired Wireless."

AT THE REGULAR SESSION of the American Railway Association, to be held at the Blackstone Hotel, Chicago, on November 17, a report will be presented by Division 1, Operating, Telegraph and Telephone Section.

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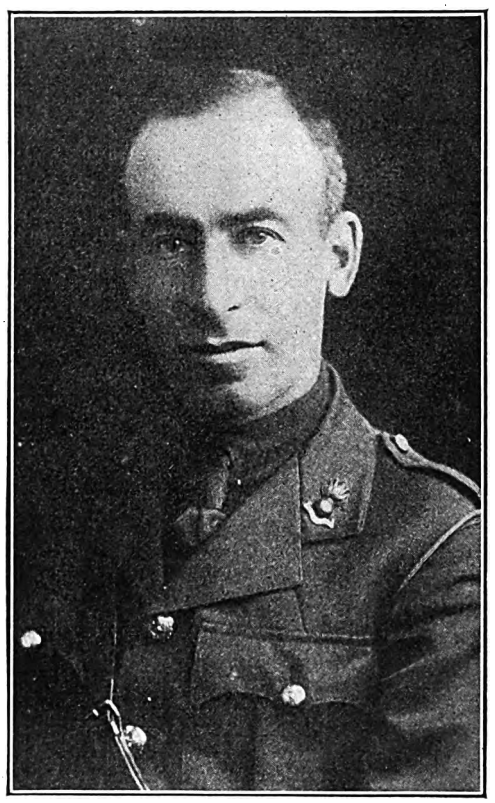
FRANK E. CAMP

Inspector, Canadian Pacific Railway Company's Telegraphs

Mr. Camp, who occupies the position of inspector in the service of the Canadian Pacific Railway Company's telegraphs at Brandon, Man., was born at Montreal, Que., on October 15, 1881, and received his early education in the schools of that city and of Westmont.

In 1901 he entered the service of the Bell Telephone Company, where during the following eight years he served as switchboard repairer and as assistant wire chief. In 1908 he entered the employ of the Canadian Pacific Railway as telephone inspector, with headquarters at Revelstoke, B. C. While in this position he gained a practical knowledge of maintenance and construction of telegraph lines, and in 1911 was promoted to the position of telegraph inspector at Revelstoke. A year later his district was divided and Mr. Camp was transferred to Nelson, B. C., in charge of the Kootenay district. In the year 1913 he was transferred to Brandon, Man., in the same capacity.



FRANK E. CAMP

In March 1916, Mr. Camp was commissioned a lieutenant in the Canadian army and proceeded overseas in August, that year. On arrival in England he was transferred to the engineer corps. In 1917 he was divisional signal officer at Bramshott, later in the year going to France and Belgium, where he was lieutenant in the Canadian Signal Corps. In July, 1919, Mr. Camp returned to Canada, resuming his position at Brandon, Man., where he still is located.

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Radio Telegraphy

Radio Corporation of America

PRESIDENT NALLY, accompanied by Commercial Manager Sarnoff, has returned from a business trip to Washington.

MAJOR CHARLES P. BRUCH of the Pan-American Wireless Telegraph and Telephone Company returned recently from Buenos Aires on the steamer *Martha Washington.*

THE RADIO CORPORATION recently entertained a large party of officials and engineers from the American Telephone and Telegraph Company and the Western Electric Company at its stations at Belmar, Lakewood and New Brunswick, N. J.

THE MARCONI WIRELESS TELEGRAPH COMPANY OF CANADA has purchased a tract of twenty-three acres situated about nine miles from Toronto, Ontario, on which it is proposed to erect a large radio station for long distance working.

———o———

THE RADIO CLUB OF AMERICA held a meeting in the Engineering Building, Columbia University, New York, on October 22, at which a paper was presented by J. G. Aceves, entitled "Determination of Resistance, Inductance and Capacity by the Wheatstone Bridge Method." A complete set, comprising bridge, oscillator and detector, was shown in operation to illustrate the feasibility of duplicating such measurements in the ordinary radio laboratory. The simplicity of measurements at radio frequencies was discussed in detail, also the precautions which should be taken in precision measurements.

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Radio Sets Wanted in South America

The government of one of the South American republics desires to purchase about 20 small inland wireless sets. The type and size of the plants desired are about 1 KW., with a land radius of 150 miles under all conditions. Prices should include the complete set ready for installation or actually installed, the latter preferred.—*No.* 33,721, *Bureau of Foreign and Domestic Commerce, Washington, D. C.*

———o———

AT A MEETING of the South Africa Association for the Advancement of Science recently, it was decided to request the Union government to erect a radio telegraph station of sufficient power to communicate with Europe and North America.

THE AMALGAMATED WIRELESS (Australia), Ltd., propose to establish duplex radio telegraph service betwen Australia and England.

Coastal Stations of the International Radio Telegraph Company

The International Radio Telegraph Company, which is handling a gradually increasing amount of radio message traffic, maintains five thoroughly equipped transmitting and receiving stations on the Atlantic coast.

The station in Brooklyn, N. Y., call letters WCG, is now equipped with 2 KW. and 5 KW. spark transmitters—300-450-600 and 2,200 meter wave lengths, and a high power arc transmitter is being installed. The station is open for business at all times, day and night. The station has direct wire telegraph and telephone connection with land line distributing centers.

At New London, Conn., station WLC is equipped with 1 KW. and 3 KW. spark transmitters—300 and 600 meter wave lengths. A 5 KW. arc transmitter—1800 to 3000 meters, is now being installed. The station is open continuously and has wire connection for the collection and distribution of messages.

The station at Newport, R. I., call letters WCI, has a 2 KW. spark transmitter—300-450 and 600 meters, and is open normally from 8 a. m. until 5 p. m. daily. Wire connection is maintained to telegraph and telephone centers.

The Siasconsett, Mass., Station, call WSC, has a 2 KW. spark transmitter—300-450-600 and 2200 meters. The station is open at all times and has wire connection with telegraph and telephone distributing centers. This station is located on the farthest east point of Nantucket Island, and is the "nearest station" within the meaning of the London Convention to North Atlantic ship lanes, between Canadian stations and New London, Conn.

Cape May, N. J., station, call letters WCY, has a 3 KW. spark transmitter—300-450 and 600 meters. The station is open continuously and has direct wire connection with telegraph and telephone centers.

All of these stations are equipped with the Heterodyne method of continuous wave reception.

A high-power station for both spark and continuous wave long distance communication is now in course of construction at a point on the Maine coast. The call letters of this new station will be WNN.

The company has a capable staff of engineers and has been successful in obtaining the services of expert radio operators for employment at the various stations.

———o———

IN CHICAGO there are 262 licensed radio telegraph amateurs. Throughout Illinois and neighboring States there are 872 amateurs.

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Student's Course in Technical Telegraphy

Lesson No. 15

Induction Coils and Tranformers

In considering the principles of induction coils and transformers it is customary in instructional articles first to go through a chapter on alternating currents, but for the present purposes in this course it will suffice to show two or three typical circuits containing induction coil windings and transformer connections.

Fig. 33 illustrates the arrangement of magnetic circuit and electrical circuits of a two-winding transformer. It may be noted that what is termed the primary circuit is of rather coarse wire and relatively few turns, while the secondary circuit is of finer wire and a greater number of turns. In each case the wire is thoroughly insulated so that the wire itself may not come into contact with the iron frame on which it is wound.

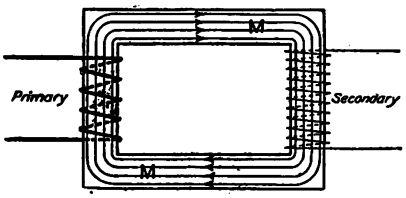

Fig. 33

Using accompanying telegraph apparatus to demonstrate the operation of the transformer its operation may be explained as follows: Connect a few cells of dry battery, a telegraph sending key and a sounder in series in the primary circuit, and in the secondary circuit a 150-ohm telegraph relay only. Now, when the key is closed a magnetic field will be built up in and around the iron core, the entire closed iron circuit being magnetized. During the instant that the magnetism is building up to maximum strength a "secondary" current is induced in the winding of the secondary coil and this current flowing through the magnet windings of the connected telegraph relay results in the armature of the relay being attracted toward its closed contact. The armature, however, is immediately released due to the fact that current flows in the secondary circuit only while the magnetism in the transformer core is changing in value; that is, increasing or decreasing. It is evident that so long as the key in the primary circuit is held closed constant current flows through that circuit and the magnetism remains stationary after reaching maximum value. When the key is opened the magnetic lines of force in and around the iron core of the transformer disappear, but in disappearing again cause a change in the magnetic state of the core which results in a second electrification of the secondary circuit containing the relay. The armature again being momentarily attracted.

The windings of the transformer illustrated are arranged for "step-up" transformation. If the voltage applied to the comparatively low resistance winding of the primary circuit is, say, 10 volts, the

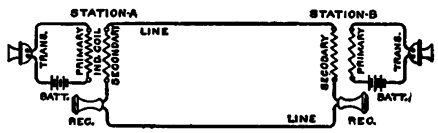

Fig. 34

voltage induced in the high resistance, or secondary winding, may be 20 volts—the ratio of transformation depending upon the ratio of turns of primary to secondary winding. Obviously, the reverse arrangement is possible—a high line voltage may be reduced to a lower potential for operating purposes.

From the foregoing the student may understand that when an alternating current is applied to the primary terminals of the transformer, say a 110-volt current changing from positive to negative sixty times per second—60 cycles—the current flowing in the secondary circuit will be of the same frequency but of a voltage depending upon the relative number of turns in the two windings.

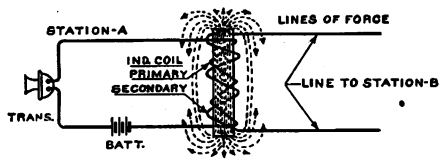

Fig. 35

In principle the transformer and the induction coil are practically the same—each has an iron core and two insulated windings. The induction coil usually has an "open" core, while transformers usually have "closed" cores. Fig. 33 illustrates a closed core transformer. An open core consists simply of a straight iron rod or small bundle of iron wires tied together.

Fig. 34 illustrates an elementary telephone circuit between two stations. It may be noted that at each end the talking battery, the transmitter and the

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primary winding of an induction coil are connected in series, while the secondary circuit of the induction coil at each end of the line, the telephone receivers and the line wires are connected in series. In this illustration the cores have been left out, but are understood to extend between the primary and secondary windings of the induction coils.

Fig. 35 illustrates the action which takes place in the induction coil while conversation is being carried on. The primary and secondary windings of the induction coil are wound on a common core. When the transmitter is spoken into the resultant variations in air pressure on the telephone diaphragm varies the electrical resistance of the primary circuit, the result of which is that the magnetism in and around the core of the induction coil is increased and decreased in accordance with these variations. As the secondary winding (the main line circuit) is wound on the same core it follows that the currents induced in the secondary circuit imitate the current variations taking place in the primary circuit. The advantage of the coil is that it is wound to act as a step-up transformer so that relatively low voltage in the primary circuit becomes high voltage in the secondary circuit, capable of actuating telephone receivers at the far end of long circuits.

Students are reminded that each lesson should be thoroughly studied and reviewed many times, as future examinations will be based on the papers published, and correct answers can be given only when the various subjects are thoroughly understood.

(To be continued)

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

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Rushing Telephone Supplies

In an effort to increase the output of telephone materials, the lack of which is mainly responsible for the present inability of the telephone companies to supply new subscribers with service, the Western Electric Company has brought its organization up to the highest point in its history. An increase in personnel has been accomplished at each of its works. The number of employees at its main factory at Hawthorne, near Chicago, passed the twenty-two-thousand mark in October.

Practically ninety-five per cent. of the world's transmission apparatus is manufactured at the Hawthorne plant. The factory covers an area of 210 acres, 3,500,000 square feet being devoted entirely to departments producing talking and listening instruments. During August more than 100,000,000 pounds of steam and 2,500,000 kilowatt hours of electricity were consumed in maintaining this plant.

During the year which finished on June 30th, an almost incredible amount of raw material gathered from the four corners of the earth was transformed into finished telephone equipment at Hawthorne. The essentials consumed in making the apparatus which is so badly neded by the public included 3,500,000 pounds of copper; 18,000,000 pounds of steel; 100,000,000 pounds of lead; 1,000,000 pounds of antimony; 10,000,000 pounds of brass, 9,000,000 pounds of cable paper; and 2,000,000 pounds of silk and cotton yarns. In addition, 10,000 tons of galvanized iron and steel wire and strand; 12,000 tons of pole line hardware; 24,000,000 feet of lumber products; 12,000,000 duct feet of clay conduits; and 10,000,000 glass insulators were purchased in the twelve months by the Western Electric Company for its telephone consumers.

On one rush day in September, 272 tons of lead was used, while the average consumption for a week was 1,200 tons. Figures also show that 71,000 miles of wire were made into cable in a single week.

Book on Mathematics

Mathematics for Engineers, Part II, by W. N. Rose, is now ready for delivery. Volume I of this excellent work on mathematics found a ready sale among telegraph and telephone engineers, and those who have copies of the first book will find the additional volume of material assistance in gaining a knowledge of advanced engineering mathematics. The price is $7.00 per volume—From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

RALPH W. POPE, honorary secretary of the American Institute of Electrical Engineers, who has been spending some weeks at his old home at Great Barrington, Mass., has returned to his home at Elizabeth, N. J., for the winter months.

P. B. DELANY, the well-known telegraph engineer and inventor, has returned to New York from his summer home at Nantucket, Mass., where he spent the summer months.

K. M. HU AND S. H. CHANG, of the government telegraphs, Pekin, China, who have been in the United States during the past year and a half studying American telegraph and telephone systems, returned to their native land on October 31. Six other Chinese students of telegraphy and telephony are now in this country, and after they have gained a sufficient knowledge of modern methods to be of value in China's reorganization of wire systems they will return home.

A. H. GRISWOLD, formerly plant engineer, Pacific Telephone and Telegraph Company, has been appointed assistant chief engineer of the International Western Electric Company, New York.

CHARLES R. UNDERHILL, well known in the telegraph and radio fields, is now consulting electrical engineer for the Acme Wire Company, New Haven, Conn.

H. H. HARRISON, engineer in the service of the Automatic Telephone Manufacturing Co., Liverpool, England, is in the United States, where he will spend several weeks investigating American engineering and traffic methods. Mr. Harrison is well known in this country as the author of important papers dealing with the subject of printing telegraphs.

AN ADDITIONAL FOUR STUDENTS from the College of Posts and Telegraphs, Pekin, China, have arrived in the United States to take up the study of telephone installation and operation. They are: Kien G. King, Shing M. Lee, Chang T. Hung and Feng S. Tao.

Underground Wires

A telegraph man who lives in a "duplex" house in New Jersey says he is in favor of burying wires underground. His interest in the matter, however, is due to a desire that the wires in his neighbor's piano should be thus disposed of.

POSTAL TELEGRAPH-CABLE COMPANY

H. SCRIVENS, superintendent, Pittsburgh, Pa., was an executive office visitor recently.

C. A. COMSTOCK, assistant to the general manager, spent a week recently in Philadelphia, Pa., in the interest of the local service.

W. C. DAVIET, assistant to the general manager, has returned to his office from an official trip which took him as far west as St. Louis, Mo., and south as far as Augusta, Ga.

RUFUS GOULD, of the plant department, is on a trip of inspection which will include stops at Philadelphia, Pittsburgh, Buffalo, and other terminal offices.

NEW MEMBERS of the plant department staff include H. W. Dunham, transferred from the staff of Division Engineer D. H. Gage; S. N. Carpenter, transferred from the city maintenance department, and Miss Evelyn Richards, stenographer.

WITH THE COMPLETION, in September, of line wire transpositions between Indianapolis, Ind., and St. Louis, Mo., long distance telephone service between these two cities was inaugurated. This gives St. Louis telephone communication with Indianapolis, Cincinnati, Louisville, Terre Haute, and other central western cities.

MISS HELEN REYNOLDS, daughter of Edward Reynolds, vice-president and general manager of this company, according to announcement, is engaged to Allen Johnston Steen, of New York, the wedding to take place some time early in the coming year. Miss Reynolds saw active service in France during the late war as a Red Cross worker. Mr. Steen also was in the military service.

MANAGERS APPOINTED: N. H. Bregman, Muskegon, Mich.; Irmine Henry, Laramie, Wyo.; H. L. Rust, Kokomo, Ind.; C. Benford, Madison, Ga.; Miss M. L. King, Oscala, Fla.; R. S. Thornton, Greeneville, Miss.; A. J. Rowe, Portsmouth, N. H.; T. E. O'Brien, Pine Bluff, Ark.; M. W. Brock, Kewanee, Ill.; C. S. Palmer, Charlottesville, W. Va.; Miss Belle Holt, Berkeley, Cal.; Howard Jolly, Orangeburg, S. C.; J. T. Land, Vicksburg, Miss.; G. W. Reid, Camden, S. C.; S. S. Burkett, Springfield, Ill.; S. L. Gibson, Baldwinsville, N. Y.; M. F. Salazar, Springer, N. M.; C. A. Mathany, Mansfield, Ohio; Fannie Moreno, Grand Island, Neb.; R. H. Browne, Beaumont, Tex.; Joseph Milan, Portsmouth, Va.; and E. E. Butler, Louisville, Ky.

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New York Postal

W. R. POST, eastern traffic chief, main operating room, has returned from his summer vacation which he spent at points in New Jersey.

V. SCINTA, who operates the Elmira, N. Y., circuit, and Miss I. Lott, operator on the Worcester, Mass., circuit, were married recently.

THE OFFICE at Fifth Avenue and Forty-second Street (Fa.) has recently had staff additions which include Andrew Mackin, transferred from another branch office; Miss Dora Rall, operating the main office bonus circuit, and Mr. Keating, returned from the south.

A. GAHR has been appointed manager of the branch office at 145 East 23rd Street.

WALTER MASON, of Tulsa, Okla., has joined the operating staff at the branch office in the sugar district.

Boston, Mass., Postal

CHARLES B. PARMENTER, all night chief operator, is spending his vacation on Cape Charles. He is accompanied by Mrs. Parmenter.

CHARLES E. SMITH has returned to duty after an illness of several weeks.

FRED E. GORE, late in United States Army service, has entered the employ of this company.

ELEANOR TIRRELL, who has been substituting as manager at the Adams, and Framingham, Mass., offices during vacations, has returned to the main office.

J. F. CARNEY, manager of the Chamber of Commerce branch office, is in New York on vacation.

THE BOYLSTON STREET branch office was recently renovated and now presents an up-to-date appearance.

MISS K. J. WHITE, manager of the office in the theatre district, has returned to duty after a month's illness.

E. KIMMEY, superintendent, visited the office at Worcester, Mass., recently. P. S. Durgin is manager at Worcester.

D. H. GAGE, division engineer, New York, inspected the Worcester, Mass., office recently with a view to improving the lighting facilities.

WILLIAM RYAN, district foreman, plant department, Boston, was a recent official visitor at Worcester, Mass.

Bufalo, N. Y., Postal

G. P. WYCOFF, manager of the operating department, main office, is away on his annual vacation.

F. W. LILLIE has been appointed audit clerk in Superintendent H. D. Reynolds' office, vice F. J. Moriarity, resigned.

RALPH E. YOUNG has been appointed operator at Dunkirk, N. Y.

Pittsburgh, Pa., Postal

JOHN C. PURCHES has been appointed manager of the office at Erie, Pa., vice John L. Liston, resigned to go to Denver, Colo.

A. L. ZANER, formerly operator at Erie, Pa., has been appointed manager at Sharon, Pa.

MISS R. G. BARNES, manager at Bradford, Pa., has returned from a two weeks' vacation. She was relieved by Mrs. L. M. Morrison.

MISS BLANCHE MARLAND, manager at Butler, Pa., has returned from a vacation spent at Washington, Pa. She was relieved by Miss Florence Dayton.

Seattle, Wash., Postal

H. E. PATTON, superintendent, recently visited offices in Tacoma, Wash., and Portland, Ore.

L. L. CRAFT, manager at Tacoma, Wash., has been transferred to the managership at Portland, Ore., vice John Annand, resigned to enter other business.

A. B. CHRISTOPERSON, of Seattle, has been appointed manager of the office at Tacoma, Wash.

Typewriting Speed

At the seventeenth national business show, held in Grand Central Palace, New York, on October 25, there was a typewriting speed contest in which George L. Hossfeld won the championship by writing 131 words per minute over a period of one hour. The prize was $1,000 in cash and a free trip to Europe. Other contestants were Margaret B Owen, who in previous annual contests won the championship four times, and William Oswald, who won the championship in 1919. Miss Owen's average for the hour was 128 words per minute, and Mr. Oswald's 127 words per minute. Mr. Hossfeld lives in Philadelphia, Pa.

THE FIRST ELECTRIC CLOCKS were made by Hamblin, in Boston, Mass., in the year 1868.

THOMAS A. EDISON'S first patent was granted in the year 1868.

Death of C. B. Rawlins

Charles B. Rawlins, grand secretary and treasurer of the Order of Railroad Telegraphers, died at his farm near Moores Hill, Ind., on October 7, as a result of complications following two attacks of influenza suffered while that disease was epidemic.

At the time of his death Mr. Rawlins was forty-one years of age and had been in railroad telegraph service since he was fifteen. Interment was at Moores Hill on October 10, the funeral being attended by a number of the officers of the order, including President Manion and Past-President Perham.

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WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president of the Western Union Telegraph Company, has been elected a director of the American Sugar Refining Company to fill the vacancy caused by the resignation of Edwin F. Atkins.

G. R. BENJAMIN, engineer of automatics, returned on October 26 from an official trip to the cable stations at North Sydney, N. S., Hearts Content, and Bay Roberts, Newfoundland.

C. M. BRENTLINGER, general inspector, traffic department, and who is in charge of the cable training school at Miami, Fla., was a New York official visitor on October 22 and 23.

I. S. COGGESHALL, of Vice-President Fashbaugh's department, is away for two weeks on a combined vacation and honeymoon trip.

E. W. GRIFFITH, of the engineering department, is in Buffalo, N. Y., in connection with power plant matters.

A CONFERENCE of officials and managers was held in Indianapolis, Ind., on October 14, at which were present L. E. Ragsdale, of the general manager's office, Chicago; E. Boening, district commercial superintendent, Detroit, Mich., and E. W. Malloy, Lansing, Mich. Office managers from offices in Indiana, Illinois and Michigan attended the meeting. A luncheon was served at the Hotel Severin.

AT A HEARING before the Corporation Commission in Phoenix, Ariz., on October 12, to consider an application from the Western Union Telegraph Company for permission to increase intrastate rates to the extent of 20 per cent., the following company representatives were present: M. T. Cook, general manager, San Francisco, Cal.: R. J. Meigs, valuation engineer, New York; J. J. Clunan, accounting department, New York, and E. C. Vanderbilt, district commercial superintendent, Los Angeles, Cal.

B. J. GRAYBILL, manager of the Joplin, Mo., office, has been appointed manager of the South Bend, Ind., office of this company.

New York Western Union

Herrick A. Smith, of the Richmond, Va., office, for many years past, and who acted as agent for TELEGRAPH AND TELEPHONE AGE at that point, has been transferred to the traffic department in the New York main office.

CAPTAIN THOMAS F. CLARK has been advanced to the position of assistant chief operator in charge of the copying and neostyle department of the New York main office. The establishment of this new department will give Captain Clark an excellent opportunity to exercise his ability as an organizer and a producer of improved service. It is now common experience to have "books" of from 1,500 to 2,000 telegrams received for multigraphing and addressing, and the new department will be able to expedite the transit of such messages through the office. Captain Clark has had many years' experience with the company; is held in high esteem by employees in all departments, and is up to date in his knowledge of traffic handling.

Chicago Western Union

MISS JESSIE LANSING MOLLER, of General Manager A. C. Cronkhite's office, has returned from a seven weeks' vacation, which was spent at points on the Pacific Coast.

C. J. ELDRIDGE, formerly of the general manager's office, Chicago, has resigned to enter the service of S. C. Osborn Company, manufacturers.

A. KENNETH ROSS, complaint clerk in the general manager's office, Chicago, while on a week-end trip to the Dunes, was drowned in Lake Michigan on September 6. While swimming with a party of friends he was seized with an attack of heart failure, and although aid reached him quickly he was dead when brought to shore. Mr. Ross was an enthusiastic woodsman; a member of the Prairie Club and a booster for out-of-door sports. He had been in Western Union service continuously during the past eight years.

MISS ELLA A. ALBRECHT, head of the stenographic department of the Chicago plant office, died recently of nervous exhaustion. She had been ill for some months. Miss Albrecht had been in the service during the past ten years and had become a very valuable employee. Her loss is keenly felt by all of her associates and friends.

THE MESSENGER BOYS attached to the Detroit, Mich., and Cleveland, Ohio, offices have for some time been at odds because of statements made relative to their respective speeds in getting from point to point. To clear the dispute, a tournament was scheduled for October 13. The hours selected were between 9 a. m. and 5 p. m., and when the tally was made the Detroit boys had won by a safe margin. This settles the matter for the time being, so sar as Cleveland is concerned, but the Cleveland boys say there will be another day and another tournament—and besides, there are other cities to be heard from when the tournament idea gains due circulation.

A BRANCH OFFICE in Detroit, Mich., was robbed one evening in September. According to the report of the man in charge at the time the highwayman walked boldly up to the counter and announced: "Night message collect; hold up your hands," and while the operator's hands were raised aloft the robber proceeded to "collect" for the night messages which had been sent.

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THE DETROIT NEWS, in a recent issue, said: "Thomas A. Edison will know whether the messages he expects to receive from the spirit world are from telegraph editors. He will be able to judge by the spelling."

AT MILWAUKEE, WIS., on August 26, a serious accident occurred in the boiler room of the building in which the company has its main office. Equipment Foreman Laass and Messengers John Kluppen and Clarence Mongan formed a rescue squad and performed heroic service in rescuing one of the coal passers who had been badly scalded by escaping steam.

Richmond, Va., Western Union

AMONG RECENT OFFICIAL VISITORS from Southern Division headquarters, Atlanta, Ga., were J. R. Terhune, in charge of legal matters, and H. W. Griffis, in charge of commercial development.

A COMMERCIAL DEVELOPMENT MEETING was held at Norfolk, Va., recently presided over by A. C. Kaufman, of Vice-President Willever's department, New York. Among those who attended the conference were G. O. Summers, city superintendent, Richmond; E. W. Minor, commercial agent, and B. C. Wilkes, office manager, Richmond.

W. G. SALE, district commercial superintendent, who recently underwent a minor surgical operation, has recovered satisfactorily and is again at his desk.

C. B. SNELLINGS, branch office manager, who resigned recently, has been succeeded by Miss Anna B. Johnson.

MISS I. M. BELL, of the commercial department, has been advanced to the managership of the branch office in the Virginia Railway and Power building.

W. C. WILDER, of the testing and regulating department, and president of the Association Western Union Employees, Local No. 9, has been transferred to Columbia, S. C., as late night chief operator. He is succeeded here by J. C. Murphy, heretofore chief clerk, first district, and vice-president of the Employees' Association.

B. C. WILKES, office manager, appeared before the Kiwanis Club as the principal speaker at a recent meeting. His subject was "Time—How to Get More of It." Members of the club and the local press commented favorably upon Mr. Wilkes' presentation of the subject.

Telegraph and Telephone Life Insurance Ass'n

Assessments Nos. 685 and 686 have been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of W. C. Cox, Somerville, Mass.; John M. Fogle, Phoenix, Ariz.; Warren G. Cole, Nickerson, Kan.; John C. Watts, Vincennes, Ind., and J. G. Harter, Seattle, Wash.

R. H. UNDERWOOD
Commercial Agent, Indianapolis, Ind.

R. H. Underwood, heretofore commercial agent at Indianapolis, Ind., has been appointed a member of the general manager's staff, Lake Division, Chicago, Ill., and has been assigned to take charge of the managers' training school at Niles, Mich. Mr. Underwood brings to his new position a wide telegraph experience which will be of particular value in developing the highest possibilities of the new

R. H. UNDERWOOD

undertaking. He was born in West Baden, Ind., on May 24, 1892, and learned telegraphy while working as station helper and clerk at the Monon Railroad depot in his home town. In 1914 he entered Western Union service, in 1916 becoming manager at Evansville, Ind., from which position he was later advanced to the position of commercial agent at Indianapolis, Ind.

WESTERN UNION REPORT

Net Income for Nine Months Estimated at $10,198,000

E. Y. Gallaher, vice-president and comptroller of the Western Union Telegraph Company, on October 15 made public the following financial statement for the nine months ended September 30 last (September figures partly estimated): Gross revenues, including dividends and interest, $91,590,000; maintenance, repairs and reserved for depreciation, $12,212,000; other operating expenses, including rent of leased lines, taxes and employees' income participation, $68,181,000; total expenses, $80,393,000; balance, $11,197,000; deduct interest on bonded debt, $999,000; net income, $10,198,000. It is explained that the operations for first nine months of 1919 are not stated for comparison as the land line system was under Federal control for a part of that period.

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Telegraph and Telephone Age

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No. 22 NEW YORK, NOVEMBER 16, 1920 Thirty-eighth Year

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ge. This tank is sunk into a pit under the base-ment floor and is filled by gravity from the car. A standard Browser registering filling station pump s used to transfer oil to the 200-gallon tanks.

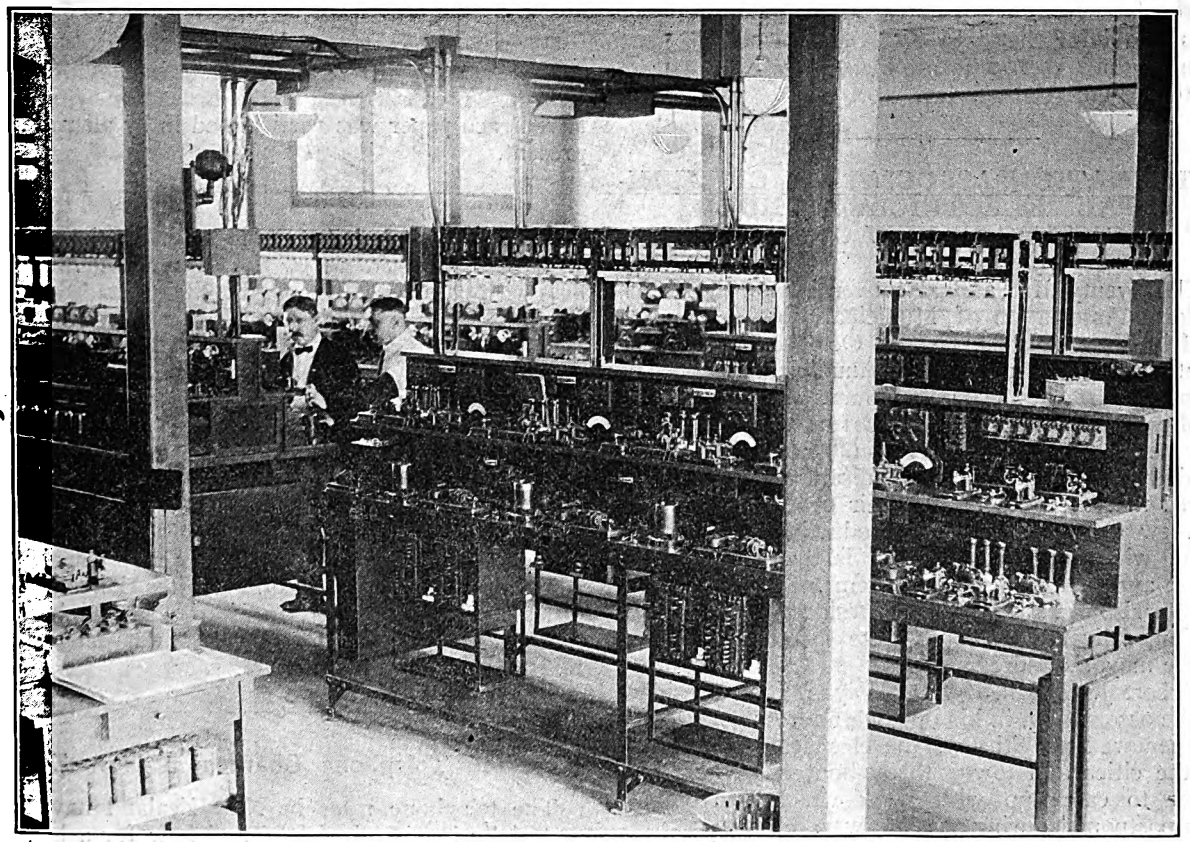
No city water is available, the building water upply being furnished by a 40-ft. well, a motor-lriven automatic pump delivering water to a 650-gallon pressure tank. Hence, a circulating cooling ystem is used on the engines (each engine having 1 400-gallon tank).

The control switchboard consists of four panels. Each generator has a separate control panel with voltmeters, ammeters, circuit breaker, field rheo-stat and paralleling switch. The feeder panel has a watthourmeter on the bus bars and has switches controlling power service, lighting, motor pumps, storage battery and water-still. The storage bat-tery panel has equipment for charging six banks of battery simultaneously. This battery is a small one, providing 110, 160 and 240 volts with ca-pacity for two hours' service only, thus preventing failure in case one engine stops suddenly and the other does not start quickly.

The telegraph equipment, with minor exceptions, consists of a standard installation. All wires are brought to the terminal frame in two underground cables. The switchboard, Fig. 1, consists of two sections of pin-jack type equipment with eighty line circuits, about seventy-five of which are in use. All loop circuits are terminated on spare jacks in the main line sections.

Fourteen Universal Repeaters (a high speed re-peater adaptable to any class of wires or service using polar relays) comprise the main part of the telegraph equipment. They are mounted on three steel frame repeater tables (Fig. 2). The Univer-sals are used on a number of overland circuits handling both Morse and printing telegraph ser-vices. Their use permits an increase in the aver-age speed at which these circuits are operated and also keeps up the operating margin sufficiently to prevent failures formerly experienced during stormy weather. Five quadruplex repeaters (direct point on polar side) are used for improvement of circuits of that type. Several single line half-re-peaters have been added for use during wire pros-trations or special occasions.

All local circuits are operated directly from the 110-volt service, both positive and negative sides being used to maintain a balance on the generator. Three 50-volt generators driven by 220-volt motors are operated as "boosters" on the 110-volt service to provide 160-volt potentials. Likewise, three 130-volt generators provide the 240-volt potentials. The latter are used on the quadruplexes and as the abnormal potential on the Universals. All telegraph



CAMP DOUGLAS, WIS. REPEATER TABLES

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circuits are fused on a panel alongside the motor generator panels. These three panels are located in the operating room, while the engine generator equipment is all in a separate room. Two four-pole switches are used to switch from the regular sources of potential to the storage battery. A lamp on this panel is so connected that it is lighted by the storage battery as soon as the generator voltage drops below 100 volts. This provides emergency light by which to operate these switches at night. The office lighting cannot be thrown on the battery—the commercial service being used as a reserve. However, one circuit consisting of 3 40-watt lamps and two Hubbell receptacles is carried through the telegraph fuse panel and is cut over to the battery along with the telegraph apparatus, thus providing light to aid repair work in case both engines should fail coincident with a failure of the commercial service.

INTERNATION ASSOCIATION OF MUNICIPAL ELECTRICIANS HOLDS MEETING IN NEW ORLEANS

The twenty-fifth annual convention of the International Association of Municipal Electricians was held in New Orleans, La., on October 19-22. The meeting was well attended by municipal electricians from all parts of the United States and Canada.

Mayor Behrman, of New Orleans, in welcoming the members of the association, stated that he regarded them as disciples of Edison, and as such he hoped that the outcome of their deliberations while in New Orleans would be productive of improvement wherever improvement is possible in fire alarm and police signaling systems. Clark E. Diehl, of Harrisburg, Pa., former president of the association, delivered an appropriate speech in response to the mayor's address.

Robert J. Gaskill, of Fort Wayne, Ind., president of the association, in his opening address referred to the renewed activities of the electrical departments of the cities and towns throughout the country in order to catch up with work which unavoidably was postponed during the late war.

Daniel J. Morgan, of the Hazard Manufacturing Co., delivered a paper on the subject of "Rubber Insulation," which was followed by a technical discussion of the relative merits of paper covered and rubber covered cables used in signaling installations.

W. S. Boyd, secretary of the Western Association of Electrical Inspectors, Chicago, Ill., presented a paper entitled "Vital Importance of Voluntary Association."

A. L. Duckett, of Asheville, N. C., presented an interesting paper on the subject "Fire Alarm Boxes vs. the Telephone as a Means for Calling Fire Departments." The paper itself, and the discussion which followed, made it clear that the telephone method is not so dependable as regularly organized alarm systems—which in most cases are automatic.

E. B. Rosa, of the Bureau of Standards, Washington, D. C., submitted a paper entitled "Scientific Work of the Federal Government," which was read by W. L. Potts of Detroit, Mich.

A paper on "Emergency Signaling in Connection with Fire Department Running Cards" was presented by C. K. Ahearn of Waterbury, Conn., which discussed the various methods of attracting the attention of patrolmen while on beat duty.

H. B. Gear, of the Commonwealth Edison Company, Chicago, presented a paper entitled "Joint Construction of Pole Lines," and F. H. Findley, of the Western Electric Company, presented a paper on the subject "Private Branch Telephone Exchange in Connection With Police Signaling."

E. E. Salisbury, of the Gamewell Company, read a paper entitled "Installation and Care of Police Signal Systems.

All of the papers presented showed evidence of thorough preparation, and the discussion which followed each paper was participated in by all members present.

Officers Elected

The officers elected to serve during the coming years are: President, R. C. Turner, Atlanta, Ga.; first vice-president, Dr. C. P. Steinmetz, Schenectady, N. Y.; second vice-president, William P. Briggs, New Bedford, Mass.; third vice-president, J. L. Caldwell, Colorado Springs, Colo.; fourth vice-president, D. R. Snider, Augusta, Ga.; secretary, Clarence R. George, Houston, Tex.; treasurer, William C. Crane, Erie, Pa. Executive Committee, A. L. Duckett, Asheville, N. C., chairman; E. H. Benz, West New York, N. J.; G. P. Allen, Jacksonville, Fla.; William G. Dey, Louisville, Ky.; Claude Convers, San Antonio, Tex.; Charles K. Ahearn, Waterbury, Conn.; Walter Dilzell, New Orleans, La.; L. P. Sandiford, Savannah, Ga.; George L. Smith, Fort Wayne, Ind., and Frank K. Shinnen, Atlantic City, N. J.

Increased Telephone Charges in New Zealand

The telephone rates in New Zealand have been materially increased of late, and now for a business telephone within one mile of the exchange the charge is £9 10s. ($46.23) per annum, within two miles, £12 ($58.40), within five miles £21 ($102.20), and within ten miles, £34 ($165.46). Private telephones pay £6 ($29.20) within the first mile of the exchange, £8 10s. ($41.36) within two miles, £18 ($87.60) within five miles, and £30 10s. ($148.42) within ten miles. This is an increase of about 33 1-3 per cent. in the case of most business phones and of about 20 per cent. in the case of private phones, and is the result of the increase in wages and cost of materials.

Automatic apparatus will be installed in the principal centers of the country at as early a date as the material can be secured. It is of American manufacture and is expected to reduce the cost of operation of the telephone system.

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Trans-Atlantic Communication During the World War.

From the Chief Signal Officer's Report to the Secretary of War.

The maintenance of uninterrupted electrical communication between the War Department at Washington and the American Expeditionary Forces, expected to reach a total of millions of men, operating more than 3,000 miles from the nearest United States territory, presented many problems unique in the history of warfare. These communications were threatened by enemy activities, not only upon land, but from the surface of the sea, and from beneath the surface in the waters of the ocean itself, through which the submarine vessels of the enemy's navy were operating destructively against the commerce of the world and against the navies of the powers associated against them in the war. Because one of the important means of communication is the radiotelegraph, the problem required the study of offensive and defensive measures in the ether itself, through which radio messages must be sent. The ether permeates not only the atmosphere of the earth, but extends into surrounding space. Operations conducted in this mysterious medium to safeguard its use for the carrying of messages from the Government at Washington to the commander-in-chief of the American Expeditionary Forces constituted one of the interesting and important scientific military activities of the war.

In giving his oral instructions regarding the importance of this problem, the Chief Signal Officer of the Army stated that it constituted an illustration of the broad responsibilities and functions of the Signal Corps to maintain communication between the Commander-in-Chief of the Army and Navy and the United States Army and all of its parts wherever located upon the face of the earth.

Before his departure for the theatre of war in Europe a preliminary inquiry was made by Col. Edgar Russel, afterwards brigadier general, chief signal officer, American Expeditionary Forces, into the reliability of cable communication between the United States and Europe. At a conference which he held with experts at New York before leaving for France, it was concluded that complete severance of cable communication by the enemy was not impossible. After further developments and after additional investigations made by him in Europe, Col. Russel, in a memorandum dated August 15, 1917, to the United States naval attache at Paris, said, referring to the Atlantic cables:

"From my own experience in cable enginering, I am satisfied that it would be entirely practicable for the enemy to cut some or all of the cables whenever he considers it important enough to do so."

Again, in referring to the Atlantic cable, he wrote, on August 23, 1917, to the commander-in-chief, American Expeditionary Forces:

"There is no question of the grave situation in which we may find ourselves as a result of extensive cable cutting, which, in the belief of all of the cable authorities I have consulted, may be easily effected by the enemy. The enormous importance of immediate provision of reliable and extensive trans-Atlantic radiotelegraphic service is therefore evident. The naval attache informs me that he is taking up the matter through naval headquarters, and the earnest and immediate co-operation of all concerned is urged in this important matter."

This letter was forwarded to the Adjutant General of the Army with the following indorsement from Gen. (then Maj. Gen.) John J. Pershing:

"1. The importance of securing reliable auxiliary service by trans-Atlantic radiotelegraphy is evident. The need for such a dependable telegraphic service increases with the growth of the American forces in Europe.

"2. Immediate co-operation with the French and English Governments to secure extension of trans-Atlantic radiotelegraphic service is urged."

Upon receipt of these communications, the chief signal officer of the army directed Col. John J. Carty, Signal Corps, to prepare plans and to take the necessary steps to secure at all hazards, the continuity of telegraphic communication with the American Expeditionary Forces in Europe, and to call upon him for whatever funds, personnel and equipment that might be required. As the result of an immediate survey which he made, Col. Carty reported that the quickest results could be obtained by utilizing the high-power radio stations on the Atlantic seaboard, which were being operated by the Navy, in conjunction with the high-power radio stations in Great Britain and Ireland, and in France and Italy, employing also, if necessary, any high-power stations which might be found suitable in Canada. Immediate arrangements were made accordingly for co-operation with the navy.

On the part of the navy this involved the activities of the Bureau of Steam Engineering under Rear Admiral Robert S. Griffin, and the activities of the Department of Communications under Capt. D. W. Todd, the Signal Corps being represented by Col. Carty, who was assisted from time to time by Maj. N. H. Slaughter, Capt. C. A. Culver, Maj. F. B. Jewett, Maj. J. O. Mauborgne, and by various of their subordinate officers having special scientific and engineering knowledge of radio prob-

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lems. Because of his expert knowledge of radio matters, and particularly the radio situation in France, Lieut. M. Paternot, of the French Army, who was acting as liaison officer with the Department of Communications, United States Navy, was frequently consulted.

In cable No. 229, paragraph 5, subparagraph 2, dated September 30, 1917, the following message was sent to the Commander-in-Chief, American Expeditionary Forces, for the Chief Signal Officer, American Expeditionary Forces:

"Your letters August 23 and 29 relative radio telegraph communication and inclosed proceedings of Interallied Commission: This office fully realizes gravity of situation. Energetic steps have been inaugurated in conjunction with Navy to co-operate to fullest extent in this program. Col. Carty is in charge of these arrangements on behalf of Signal Corps. Please inform Gen. Pershing and French authorities. Will report progress frequently."

There was held on October 4, 1917, on board the U. S. S. *Chicago,* at New London, Conn., a conference to consider a protocol of the Interallied Radio Commission dated August 22, which had been forwarded by Col. Russel, who had brought to the attention of the commission the subject of maintaining trans-Atlantic communications against enemy attack. This protocol contained a statement of various measures which might be adopted, all of which, together with many originating within the conference, were duly considered. The members of the conference were Capt. S. S. Robison, U. S. Navy; Capt. D. W. Todd, U. S. Navy; Capt. A. J. Hepburn, U. S. Navy; Lieut. Commander S. C. Hooper, U. S. Navy; Lieut. Commander G. C. Swet, U. S. Navy; Col. John J. Carty, Signal Corps, U. S. Army; Maj. N. H. Slaughter, Signal Corps, U. S. Army; Lieut. M. Paternot, French Army.

A report of the findings of the conference was duly forwarded to Col. Russel, representing the United States Army on the Interallied Commission, which was sitting in France. Two important points in the communication from the New London conference were:

1. "That the Interallied Commission note the possibility of communication being interrupted by intentional interference from powerful German stations. It is suggested that the commission give comprehensive consideration to the question of avoiding or or overcoming such interference and also to the question of what should be done in the event of such interference being successfully accomplished and trans-Atlantic radio communication destroyed."

2. And the statement that: "It is urged by the American Army authorities that every effort be made to secure as nearly as possible continuous transmitting from France to America during the entire 24 hours of the day, so that emergency messages could be handled in any case. To this end it is suggested that at least one very powerful station be installed in France."

The erection of this high-power station was subsequently decided upon under an agreement with the French, whereby the French were to provide the site for the station and the United States Navy was to erect the towers and install the necessary apparatus, all of which would be supplied from America.

In the working out of this problem numerous protocols were exchanged with the Interallied Radio Commission in Europe, upon which Col. Russel, the chief signal officer, American Expeditionary Forces, represented the United States Army and the naval attache at Paris represented the United States Navy. By this means, and by liaison officers and by frequent telegraphic communications, constant touch was maintained with the experts of the Interallied Radio Commission, which was thus enabled to co-operate effectively.

The studies which were conducted and the experiments and tests which were made in the United States were numerous and many of them highly scientific in character. In general, the problem consisted, first, in providing radio stations of sufficiently high power to secure the best attainable signals even under favorable conditions; second, in finding measures to insure continuity of radio service at times of serious static disturbances; and third, to devise plans whereby, in the event of intentional interference on the part of the enemy, the radio signals might not be confused or obliterated by arbitrary signals transmitted for the purpose from high-power enemy stations.

To meet the first condition the Navy Department undertook to complete, as rapidly as possible, a new high-power station at Annapolis, Md., and to rapidly increase to the fullest extent practicable the power of all of the existing trans-Atlantic stations. In addition to this, the Navy designed and undertook the erection of a high-power station near Bordeaux, in France, which was the station recommended by the New London conference and which was intended to be the most powerful station which had yet been constructed.

To meet the second condition, tests were made by the navy at various naval radio stations on the Atlantic coast to determine those locations in which the least static disturbances were likely to prevail. Corresponding investigations were made on an extensive scale by the Signal Corps, which sent numerous expeditions to different parts of the United States to make electrical and meteorological observations; to determine the intensity of static disturbances and their relation to meteorological conditions; the degree of intensity of signals received; and to get all other scientific data obtainable, which might bear upon the problem.

To meet the third condition, intentional interference, numerous scientific methods were tested and studied at the navy stations and elsewhere.

As a result, a comprehensive plan was adopted whereby, in case of necessity, receiving stations at Newfoundland in the north, and along the Atlantic coast of the United States and elsewhere, and throughout the United States as far west even as

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he Pacific, might be employed. As many of such tations as would be required would be connected y wire with Washington, so that the chances of a rge number of widely separated stations being imultaneously interfered with by static or otherise would be minimized. Each of these stations ould be equipped to receive the same trans-Atlanc radio msesages, and each telegraph the message y wire to Washington. By this plan the missing arts of a message which could not be received at ne station, could be supplied from one or more of he other stations out of the zone of interference. The details of other features of the plan are many f them very scientific in character, voluminous in mount, and are still regarded as confidential.

Word was received from the Navy Department arly in May, 1918, that the enemy was employing ubmarine vessels to cut cables and that certain ocal European cables had already been cut, preumably by this means. In the following June it vas reported by the Navy as coming from sources elieved to be reliable that the Central Powers were naking preparations to cut all cables on the Amerian coast by specially constructed submarines, and hat it was also planned to destroy simultaneously ll high-power American wireless stations. If this cheme were unsuccessful, it was reported that the nemy planned to make communication difficult by ntentional interference by German high-power raio stations. Upon receipt of this information, a onference was held by Col. Carty at the office of he Director of Naval Communications at Washngton, at which were present Capt. D. W. Todd, he director, Maj. C. A. Culver of the Signal Corps, Commander Reed M. Fawell and other officers of he navy. Immediate steps were taken to put into effect as rapidly as possible all of the measures which had already been agreed upon. Capt. Todd reported that the United States naval authorities had adopted adequate measures to protect the naval wireless stations from attack.

Information furnished by the navy concerning the enemy's intentions seemed to be well founded, for while the German submarine vessels were operating on the Atlantic coast of the United States, two submarine cables were cut about 100 miles from New York, one a cable from New York to Canso, which stopped working at 12.35 p. m. on May 28; the other, a cable from New York to Colon, which began to fail at 3.30 p. m. on May 28, and went out of service entirely at 9.30 p. m. on the same date.

These two cables were promptly repaired, but had this not been done, their cutting could not have substantially affected transatlantic communications because only one of them was used for that traffic, and that only as far as Newfoundland. For this section land lines were also available.

The severed section of each cable was carefully studied by Col. Carty and other cable experts. The conclusion was unanimous that the cables were cut and not merely worn out or damaged by ordinary causes. The points at which the armored wires were severed in both cables showed clearly the evidence of a sharp-cutting tool and the absence of rust on the ends of the armor showed that the cut was of recent origin. The nature of the cut and the fact that the enemy's submarines were operating on our coast at the time, taken in connection with the other circumstances of the case, pointed strongly to the conclusion that the interruption was produced deliberately by the enemy for the purpose of destroying telegraphic communication.

While indefinite reports were received concerning the cutting of cables elsewhere, no further damage was done to cables on the coast of the United States, and telegraphic communication, by cable and by radio, between the War Department and the American Expeditionary Forces in Europe was at all times maintained.

In its co-operation with the United States Army and with the Allies in this project the work performed by the United States Navy was indispensable. It was executed with vigor and with skill, and was successful.

A second phase of the transatlantic communications problem consisted, not in preventing the enemy from interrupting our communications, but in determining in what manner and to what extent the enemy countries themselves were utilizing transatlantic electrical communications.

Accordingly, the Chief Signal Officer, on July 12, 1917, issued office memorandum No. 51, of which paragraph 1 follows:

"A board of officers, consisting of Maj. J. J. Carty, Maj. George M. Yorke and Maj. Charles P. Bruch, Signal Officers' Reserve Corps, is hereby appointed to meet in New York City at such times as may be designated by the president thereof for the purpose of carrying out special instructions which will be communicated to the board by the Chief Signal Officer of the Army."

The Chief Signal Officer on the same day issued special instructions to this board as follows:

"Grave concern is felt by the War Department due to the fact that there is existing, without doubt, some means by which communication is being maintained between agents of the German Government in the United States and Germany. The determination of these means is a matter of utmost importance to the Government. The Chief Signal Officer of the Army, realizing the vast experience of the three members of the board appointed by office memorandum No. 51 in matters pertaining to the transmission of information, desires that they give consideration to the matter of determining by what means German agents are maintaining communication between this country and Germany, and that the board submit recommendations to this office as to the best means of preventing the same. It is of the utmost importance that all the deliberations of the board be carried out in the most confidential manner."

Immediately upon receipt of the above instructions, Col. Carty, who had been appointed president, held a meeting of the board at which various extraordinary precautions were determined upon and taken up with the cable and the telephone and

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telegraph companies. As all of the members of the board had been, in their civilian capacity, officials of telephone and telegraph companies, they were better able, because of their intimate knowledge of the working of these companies, to secure intelligent co-operation. It became evident, as the work of the board progressed, that one of the measures which might be employed by the enemy was the sending of military information under the guise of apparently harmless messages to neutral countries, which then would find their way to the Central Powers. As this was a matter which involved the censorship of cables, the president of the board worked in close co-operation with Capt. D. W. Todd, U. S. N., the director of naval communications, who had charge of the naval censorship. It was found that a thorough investigation of the handling of cable traffic and of all of the personnel concerned therewith had been conducted by the censorship officials and that rigorous methods were adopted in the handling of cable traffic. As a result of most stringent regulations of the Naval Censor, it was made certain that the sending of clandestine messages was minimized if not prevented.

It was impossible, however, to prevent the enemy from sending from its high-power radio stations messages which could be received in the United States and in the countries to the south. The radio section of the Signal Corps, therefore, systematically intercepted enemy radio cipher messages from these stations, all of which were duly reported to the military intelligence division.

Confidential information, very circumstantial in character, was received from official sources by the president of the board to the effect that a cable had secretly been laid across the Atlantic by the enemy and that the American end of the cable terminated on the New England coast; that the European end of the cable terminated in a submerged buoy off the coast of a neutral country; that at frequent intervals connection was made at the buoy with a German submarine vessel equipped with cable sending and receiving apparatus; and that in this manner prompt and reliable communication was maintained between the United States and Germany. It was stated further that the deep-sea portion of the cable had been laid by a neutral vessel and that the shore end on the New England coast was of short length and of very light construction and was laid by a German submarine.

The report, while containing elements of improbability, came from a responsible source and could not be ignored. Arrangements were made, therefore, with Mr. George H. Dresser, general superintendent of the New England Telephone and Telegraph Company, with Maj. G. K. Manson, Signal Officers' Reserve Corps, not on active service, chief engineer of the New England Telephone and Telegrap Co., and with Mr. James T. Moran, president of the Southern New England Telephone & Tele graph Co., and Mr. H. C. Knight, general manager of the company, to obtain their confidential co-operation and to provide the services of competent and trustworthy personnel from their respective companies, thoroughly familiar with the coast of New England. This personnel consisted of telephone officials, foremen and linemen, whose daily work gave to them intimate knowledge of all of the wires on the coast of New England. Through these agencies the entire coast from the Canadian border to New York was thoroughly searched for evidences of an enemy cable connection. No enemy cable was found and the investigation was so thorough that it became certain that it did not exist. While this was the result which might be expected, the question was so important as to demand a positive answer, and this was obtained.

A third phase of these transatlantic communications was developed by the Chief Signal Officer, who directed Col. John J. Carty to study the possibility of sending messages in plain English from the War Department at Washington to the American Expeditionary Forces in France and England in such a manner that they could not be intercepted by the enemy, the object of this being to save valuable time which was being consumed in coding and decoding cablegrams.

Col. Carty undertook this study as directed and gave his attention, first, to the remarkable printing telegraph system which had recently been perfected in the United States. By this system eight messages may be sent simultaneously over one telegraph wire, each message being received in printed form like a page of a letter written upon the typewriter.

To intercept one or more of the eight messages thus being sent would be impossible by any ordinary means, particularly those heretofore found effective in tapping wires employing the Morse code. A thorough study, however, revealed the fact that by using an instrument known as the oscillograph, which records upon photographic paper the most sensitive electrical currents, the message could be intercepted. By a study of the impulse required for the formation of the telegraphic letter and by analysis of the resultant curves of the combined eight messages, the contents could be read, although this would require extreme skill and take a long time. This demonstrated that the printing telegraph system, without further invention, could not be depended upon to safeguard a message sent in plain English against the efforts of an enterprising enemy with proper scientific knowledge and equipment.

Other methods of safeguarding the land lines against wire tapping might be adopted if the security of the message upon the ocean cable could be assured. Up to the time of the making of this study it had been generally assumed that it would be impracticable to tap an ocean cable without producing an electrical disturbance at the ends, which would undoubtedly result in discovery.

After a careful inquiry into this matter, Col. Carty reached the conclusion that it might be possible to tap successfully, and without discovery, an ocean cable, by employing some recent electrical

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iscoveries. He devised a tentative scheme which as submitted to the engineers of the American elephone & Telegraph Company, who reported at the scheme was probably workable. Accordngly, experts of that company and the Western lectric Company undertook the development of e necessary apparatus. Radical improvements ere made by them upon the first suggested idea; pecial apparatus was constructed; a ship was quipped and put to sea; connection was made with n Atlantic cable and messages were intercepted, nd a clear, legible record of them was obtained. ll of this was accomplished without producing ny disturbances whatever in the working of the able or giving the slightest indication upon the ost delicate apparatus at the ends of the cable.

It was clearly demonstrated that cable tapping ould be accomplished in this manner and that able tapping so accomplished could not be detected y any possible means at the shore ends. This aluable discovery was communicated to the mili ary intelligence division and to the navy and to the llies. It demonstrated that it would be unsafe to ttempt to send plain English messages through the cean cables, and indicated a method which, if nown to the enemy, might be employed against us. t was decided that until some new discovery was ade, the ultimate protection of the secrecy of mesages must be found in the use of code or cipher.

Work upon this problem was not abandoned, owever, and at the request of Col. Carty the enineers of the American Telephone & Telegraph ompany continued their researches into the possiility of obtaining secrecy by some modification of he printing telegraph. These engineers, co-operatng with Lieut. Col. J. O. Mauborgne, Signal orps, conducted a series of experiments, and inally devised apparatus whereby a message writen in plain English could be quickly unciphered, rinted in plain letters upon a page similar to the rinting of a typewriter, and transmitted over a elegraph line and received at the distant end. This rinted cipher telegram being copied upon the deiphering machine will finally appear in plain Engish.

Many forms of this system are possible, each dapted to different circumstances. For some cases he best plan is as follows: Write the message to e sent first in plain English in the office where it riginates; copy this message upon a typewriter eyboard which perforates a long paper tape. hese perforations appear on the tape in telegraphic ode and enciphered. The tape thus perforated nd enciphered is sent to the telegraph office, where t is passed through a transmitter and thus sent ver the wire to the distant end, at which point it gain appears, still in cipher, in the form of a perorated tape. This tape is delivered to its destinaion, where, being put through a deciphering mahine, the message appears in plain English.

The sending of the enciphered message over the vire is accomplished as quickly as the sending of n ordinary message. The enciphering of the message or the deciphering of it is accomplished as quickly as an ordinary message can be copied upon a typewriter.

Manifestly, a device such as this overcomes all of the delay caused by enciphering and deciphering, and if proved to be reliable in operation and if the enciphered message is in secure form, a method has been developed whereby the time of enciphering and deciphering is saved and the transmission of the message over the telegraph wire is accomplished as rapidly as the transmission of a message in plain English. In addition to this, the safety of the message is otherwise enhanced because of the reduction in the number of those who must possess the cipher and because the message in passing through the telegraph office is in the form of a strip of paper arbitrarily perforated. The operativeness and speed and reliability of this apparatus was thoroughly tested during the war over lines carrying messages of the most confidential character from Hoboken to Washington and from Washington to Newport News. The cipher produced by this apparatus when used in accordance with the method of the Signal Corps has thus far successfully resisted all the efforts of cipher experts to break it.

How to Distinguish the Poles of an Electromagnet

The north and south poles of an electromagnet may be distinguished in two ways: Take an ordinary magnetic compass and bring it near the electromagnet. The north-seeking end of the compass needle will be attracted by the north pole of the electromagnet and the south pole of the electromagnet will attract the south end of the magnetic needle. If the direction of the current is known, the north pole of the electromagnet can be determined in the following manner: If the current flows around the magnet coil in the direction of the hands of a watch, the end of the electromagnet farthest away from the person holding it will be the north end and the end of the magnet nearest to the person will, of course, be the south end. If the current flows around the magnet from right to left, or in the direction opposite to the motion of the hands of a watch, the near end of the magnet will be north.

Book on Mathematics

Mathematics for Engineers, Part II, by W. N. Rose, is now ready for delivery. Volume I of this excellent work on mathematics found a ready sale among telegraph and telephone engineers, and those who have copies of the first book will find the additional volume of material assistance in gaining a knowledge of advanced engineering mathematics. The price is $7.00 per volume—From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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International Communications Conference

Delegates Visit Telegraph, Telephone and Radio Plants in the Vicinity of New York.

A new record of telephone achievement was made in the course of a demonstration witnessed by the members of the Preliminary International Communications Conference at a dinner given them by the American Telephone and Telegraph Company at the Waldorf, New York, on the evening of October 21. They were able to talk and listen over the line of the Bell System from New York to Los Angeles and by wireless from Los Angeles to Santa Catalina Island and eastward by wire to an Atlantic port and by wireless telephone to the steamship *Gloucester* at sea, and they were also enabled to hear people talking from the ship on the Atlantic by wireless to shore, by wire across the continent and by wireless to an island in the Pacific.

This new feat in the art of communication, remarkable in itself, was all the more interesting because it was made in connection with the dinner given by President H. B. Thayer on behalf of the American Telephone and Telegraph Company and associated companies; the Western Electric Company, Incorporated, and the International Western Electric Company, which was attended by some fifty conference delegates, representing Great Britain, France, Italy, Japan and the United States, together with the principal officers of the Bell system and of the General Electric Company and its associated companies.

The Communications Conference which has been holding sessions in Washington, took advantage of an opportunity given them by the General Electric Company and the American Telephone and Telegraph Company to inspect some of the highest development in America in the line of electrical communication.

The party left Washington Sunday night and visited the New Brunswick, N. J., wireless telegraph station of the Radio Corporation of America on Monday, the factories of the General Electric Company at Schenectady, N. Y., on Tuesday, the West Point Military Academy on Wednesday, and on Thursday the general offices of the A. T. and T. Co. in New York, the operating rooms of the Long Lines Division on Walker Street and the laboratories of the American Telephone and Telegraph Company and Western Electric Company on West Street.

At the main offices of the American Telephone and Telegraph Company demonstrations were given of the cipher telegraph, of transmission through a 1,000-mile cable and of carrier currents. At the Walker Street building they inspected the long distance switchboards, the test boards and mechanical switching apparatus, and at the West Street building they were shown through the research and development laboratories of the Bell System and Western Electric Company, where important work for progress in the art of communication is being carried on.

The dinner in the evening was at the Waldorf-Astoria, where the guests were shown a motion picture descriptive of the building of the transcontinental telephone line. They were welcomed by President H. B. Thayer and were addressed by Col. John J. Carty, vice-president of the American Telephone and Telegraph Company, who had charge of the demonstration.

Colonel Carty spoke briefly of radio development and explained the singular advantages of the wire telephone service over land and of wireless telephone transmission in situations where wires could not be used. He referred to the wireless telephone record made by the Bell System in 1915, when wireless transmission was accomplished by engineers of the Bell System not only across the continent, but from Washington to Honolulu and from Washington to the Eiffel Tower, Paris, France. In this connection he expressed gratitude for the cooperation of the Navy Department in permitting the use of the Arlington tower and of the French nation in permitting the use of the Eiffel tower, particularly of the courtesy of General Ferrie, who was in command at the Eiffel tower and who was present at the dinner.

Each place at the table was equipped with a receiver, and as Colonel Carty called the roll of the district chiefs along the route of the transcontinental line, the guests heard each answer, and learned from each the distance from New York, the local weather condition, temperature and the local time. As the roll was called a large map hanging on the wall was illuminated, so that the course of the connection across the continent could be followed.

When the connection with San Francisco had been established, conversations were held between the British Consul there and a representative of the British delegation; between the Italian consul and a representative of the Italian delegation, in the Italian language; between a Frenchman and the representative of the French delegation, in the French language, and there was to have been a conversation in Japanese but for the inability of the Japanese Consul in San Francisco to be present.

Then the connection was carried down from San Francisco to Los Angeles and a conversation was had with a representative of the company at Santa Catalina Island. The representatives of the Conference found that a communication of over 4,000 miles by wire and of 30 miles by wireless to Santa Catalina was as clear as if it had been from an-

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other part of New York City. The connection was then established with the steamship *Gloucester,* which had left port four hours before, and unfortunately had not gotten far enough from land interference to make possible the best wireless results. There was also, at times, considerable static interference. Nevertheless, the conversation between Colonel Carty and his representative on the *Gloucester* was clearly heard, and later, when the conversation was put through from the steamship *Gloucester* to Santa Catalina Island, the hundred guests at the dinner were able to hear the talk from off shore in the Atlantic to off shore in the Pacific.

In behalf of the representatives of the delegates for the Preliminary International Communications Conference, Mr. F. J. Brown, assistant secretary of the British Post Office, and presiding officer and senior delegate of the Conference, spoke in behalf of his confreres to express their high appreciation of the marvels of the art of communication which they had been shown and of the hospitality of the American Telephone and Telegraph Company and its associated companies.

OVERCOMING WIRE ERRORS IN SENDING FIGURES

Repeater Kicks, Momentary Grounds and Other Possibilities Discussed—When Repetion is Most Desirable

By A. M. Stevens,
Traffic Department, Associated Press, Boston, Mass.

"Nothing worries us." Something happened to Nothing during the handling of election returns recently—that is why it worries us.

Either the sender or receiver left the cipher off at the end of a group of figures. The sender is sure he sent it; the receiver is equally positive it did not reach him. As both are first-class men, and as all copy at other points along the circuit has been destroyed, we haven't "pinned" it on either.

The receiving operator, however, makes a suggestion that we adopt the commercial companies' style of using the letter "O" for ciphers. This seems a good idea, except of course in the case of hundred and thousand, which are properly cared for by the code "hnd" and "tnd." As there are always one or more commercial men working on an election wire, this would fit nicely with them.

There are other possibilities for errors in handling figures, such as repeater kicks, momentary grounds, etc. The loss of the final dot of a "3" might lead a careless receiver to think a "4" with a light first dot had been sent; the first dot of a "4" might be lost and the receiver think that a "3" with a poor final dot had been transmitted; a "swing" at the moment of transmitting the figure "7" might weld the two dots with the consequence that it would reach the receiver as a "5," and so on.

The safest plan, therefore, seems to be for the receiver to ask for a repetition if there is the slightest flutter or stick in an incoming group of figures, and for the sender to repeat if he feels the slightest kick or irregularity in the circuit.

If all election matter, both sent and received, were preserved for a reasonable length of time at each point, we could, after the official ballot is known, have the satisfaction, small as it would then be, of laying the blame for errors, if there should be any, at the right door.

Every operator who handled the first draft in 1917 knows that figures, with no "sense" to follow, are mean things to handle. For this reason, also because the majority of the operators on election circuits have already done a day's work, we do not follow the forms strictly, but occasionally spell out the candidate's name preceding a group of figures, just to vary the monotony. This seems to give the receivers a new starting point, just as proper pronunciation does in a sentence.

We have found a moderate, steady gait gives the best results, even though we are a little piled. Also rest periods and lunch relief, though they cannot be made at a fixed time each election, result in better time for the whole night.—*Service Bulletin of the Associated Press.*

Frank Benner, Military Telegrapher

The death of Frank Benner, as announced in the September 16 issue of Telegraph and Telephone Age, marks the passing of one of the heroic figures of the Civil War of 1861-65. In Colonel Plum's "History of the Military Telegraph," the following passage appears:

"Late on the 17th, August, 1862, Kirby Smith struck Morgan's line of communications at Barboursville and Cumberland Ford; that was Sunday; in the morning of that day, our General Morgan was advised of the movement in this way—Smith's advance cavalry, numbering nine hundred, under Colonel Scott, captured London after a brief engagement with the small command there. This command was posted some distance from Operator Frank Benner's office. While Scott was engaged with the Federals, Benner, thrusting his instrument under his arm, hurried off in the direction of Cumberland Gap, and after traveling eight or nine miles tapped the line and telegraphed to General Morgan that the enemy's cavalry, two thousand strong, had that morning taken London. It was a brave and highly commendable feat, and it so chanced that he had just quitted the line, when a squad of the enemy rode by. Benner then struck out for Lexington, Ky., which point he reached just in time to escape Kirby Smith, and was forced to continue his journey to Frankfort and Louisville."

Gas-Lighting was introduced in London, England, in the year 1800, and in the city of Baltimore, Maryland, in the year 1816.

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Student's Course in Technical Telegraphy

Lesson No. 16

Resistance of Wires

All substances offer some resistance to the passage of electricity, and fritter the energy of the current into heat. The resistance of a metal wire, if kept at an unvarying temperature, is the same whether a large current or a small current be passing through it; that is to say, the specific resistance of the substance does not vary. Varying the electromotive force in a given wire of course alters the amount of current flowing in the wire.

The unit of resistance is called the ohm, and is equivalent to the resistance offered by 377 feet of No. 8 gage iron wire or 1,056 feet of No. 11 gage copper wire.

Resistance in a circuit may be of two kinds: (a) the resistance of the conductors themselves and (b) the resistances due to imperfect contact at points. The latter kind of resistance is affected by pressure. Examples of such resistances are found in loose joints in the outside wire; in the office wiring or in the instruments.

Following are the laws of resistance of conductors:

1. The resistance of a conducting wire is proportional to its length. Thus, if the resistance of a mile of iron wire is seventeen ohms, that of fifty miles will be $50 \times 17 = 850$ ohms.

2. The resistance of a conducting wire is inversely proportional to the area of its cross section. For example, a wire one-third of an inch in diameter will conduct four times as well as a wire one-sixth of an inch thick, because it has four times the cross-sectional area of the latter, and a given length of the smaller wire would have a resistance four times that of an equal length of the larger wire.

3. The resistance of a conducting wire of a stated length and thickness depends upon the material of which it is made. Thus an iron wire of a given length and diameter will have greater resistance than a copper wire of the same length and diameter.

The Main Line Telegraph Circuit

A main line telegraph circuit may have a main battery at one end of the line or at both ends of the line. If the line is short, with only a few relays connected in circuit, a battery at one end is sufficient, but if the line is long and has a large number of relays in circuit a main battery at each end may be necessary. It is good practice to have half of the total battery at each end of the line.

The usual practice is to supply a battery of sufficient strength to maintain a current of fifty milliamperes in the main line circuit. A certain circuit 150 miles long, consisting of No. 8 iron wire and having fifteen relays connected, presents the following factors:

150 miles of No. 8 wire at 12.43 ohms per mile equals	1,865 ohms
15 relays at 150 ohms each equal	2,250 ohms
Total	4,115 ohms

If this line is to be batteried at one end only and a motor generator is used, the e.m.f. of the generator should be 205 volts. This information is determined by means of Ohm's law:

$$E = I \times R.$$

We know that the line current I required is 50 milliamperes (.050 ampere) and that the line and instrument resistance (R) is 4,115 ohms, therefore

$$E = .050 \times 4{,}115 = 205.7 \text{ volts.}$$

The voltage should not be less than this, but there would not be serious objection to it being a little higher. If, for instance, the battery for this particular line were divided and half placed at each end, then it would be convenient and good practice to apply an e.m.f. of 110 volts at each terminal; the total e.m.f. being only 14.3 volts higher than that called for to maintain a current of 50 milliamperes in the circuit.

A little figuring will show that the additional 14.3 volts will result in the current strength being raised to about 53.5 milliamperes.

If primary battery (having internal resistance) is to be employed in place of a motor generator (possessing negligible internal resistance), then the required e.m.f. may be determined by means of the following formula:

$$N = R \div \frac{E}{I} - r.$$

in which N = the number of cells required,
R = total resistance of line and relays,
r = the internal resistance per cell,
E = the e.m.f. per cell,
I = the current strength required in the circuit.

Applying this formula to the line under consideration, where it is proposed to use gravity cells having an e.m.f. per cell of 1.07 volts and an internal resistance per cell of 2.5 ohms, then

$$N = 4115 \div \frac{1.07}{.050} - 2.5 = 218 \text{ cells} = 233 \text{ volts.}$$

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When primary battery is used the additional e.m.f. is required to overcome the internal resistance of the entire battery which is added to the resistance of the main line circuit.

In the foregoing elementary calculations we have not considered the factor of leakage of current to ground, due to imperfect insulation of line wires at insulator supports. Imperfect insulation of the line wire results in the current strength in the circuit being greater near the battery end of the line and less as distance is overcome toward the non-battery end of the line.

The Effects of Imperfect Insulation of Main Line Telegraph Circuits

Assume that a telegraph line between terminal stations *A* and *B*, 200 miles apart, consists of No. 8 iron wire, has eight offices in all connected in circuit, and that a 200-volt motor generator at station *A* is used to supply the main line current.

The total resistance of this circuit (assuming that it is perfectly insulated at wire supports) is computed as follows:

200×12.43	(resistance per mile of the wire) =	2,486 ohms
8×150	(resistance of each relay) =	1,200 ohms
		3,686 ohms
Resistance of battery protecting coil,		300 ohms
		3,986 ohms

Two hundred volts applied to a circuit of 3,986 ohms yield a current of 50 milliamperes (.050 ampere), for, by Ohm's law,

$$I = \frac{E}{R}, \text{ and}$$

$$\frac{200}{3{,}986} = .050 + \text{ ampere.}$$

Assume, however, that the line is not perfectly insulated; that many of the glass or porcelain insulators are broken, allowing the wire to rest on cross arms, and that the wire is at some points in contact with the branches of trees. It may then be found that with the 200-volt battery applied at Station *A*, while the key at Station *B* is opened, a milliammeter connected at *A* in series with the circuit will show that regardless of the open key at *B* there is a current of ten milliamperes flowing through the relay at *A*. Current found flowing under these circumstances is known as "leakage," and is the result of imperfect insulation of line wires carried on pole lines.

A leakage current of ten milliamperes indicates that the joint resistance of the various paths from line wire to ground is

$$\frac{200}{.010} = 20{,}000 \text{ ohms,}$$

for by Ohm's law

$$R = \frac{E}{I}.$$

The foregoing means that with the key at *B* open, the relay at *A* still is included in a circuit through which ten milliamperes current flows from the battery over part of the line wire and to earth by way of the leakage paths.

When the key at *B* is closed it will be found that the milliammeter inserted in the line at *A* discloses that now the outgoing current is higher than 50 milliamperes, regardless of the fact that the resistance of the battery coil, line wire and relays (3,986 ohms), fed from a 200-volt battery, permits of a current through it of but 50 milliamperes.

It may be seen that the insulation resistance of the line (20,000 ohms) plays an important part in increasing the current strength at the battery end of the line and in reducing the current strength at the non-battery end of the line.

A 200-mile line such as the one here considered, which has a total insulation resistance of 20,000 ohms, has an insulation resistance of four megohms per mile; that is, 4,000,000 ohms.

(To be Continued)

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EDITORIAL COMMENT

A School for Managers

The action of the Western Union Telegraph Company in opening at Niles, Mich., a school for the training of office managers is a step in the right direction which has been long delayed.

From the beginning of the telegraph business the process has been for messenger boys to become operators and for operators to become managers of offices. Generally the first appointment has been in charge of a small way-office or a branch office in a city—promotion to more important offices following as the men developed and as opportunity presented. This system is based on logical progression. The manager who had previously worked as a messenger boy and as a telegrapher quite naturally possessed a knowledge of detail of the business which qualified him to supervise and direct the work of subordinates occupying minor positions. The most successful managers have, in turn, been promoted to superintendents' positions and to other official offices.

Some telegraph superintendents have been particularly successful in developing and maintaining high grade managerial staffs; often in spite of the fact that comparatively low salaries prevailed; long hours had to be worked, and that promotion was discouragingly slow. Superintendents who were conspicuously successful in this regard were the big men of the business—in many instances too big for the places which they themselves occupied.

In considering the qualifications which should be possessed by office managers it is of importance to study the continuously changing conditions in the business world generally. To better, to improve, to perfect are organization slogans in most industries. As the business of the multitude of national industries grows as a result of organization betterment and the adoption of improved business methods, it follows that the volume of telegraph business increases. The present great volume of telegraph traffic is the proof of this.

The manager of a telegraph office comes into daily contact with the most influential and progressive business men in his community. He has occasion daily to talk to and correspond with the live wires who are second or third in command of large business undertakings. It is natural for business men to judge the efficiency of an organization by its managerial representation, and it is plain that the telegraph in order to keep abreast of the times must set about improving the calibre of its representatives. Of course, most of the large centers have thoroughly capable telegraph managers, and the fact that at many of the smaller offices less competent men have been placed in charge may, in some measure, be due to lack of training which the companies neglected to supply.

Wire chiefs, apparatus attendants, electricians and engineers have at their command extensive libraries of books and periodicals dealing with the technical side of telegraphy, which accounts for the high standards of line and circuit maintenance that prevail. Telegraph employees engaged in the purely commercial side of the business have little in the way of instructional literature beyond a "follow the line" rule book, and a tariff book which, although indispensable at the receiving counter, is as devoid of hope or inspiration as a price list of marble slabs.

The establishment of a school for training managers is an encouraging sign if it is a forerunner of other schools to follow—schools in sufficient number to permit of giving every manager in the country an opportunity to thoroughly post himself on the best methods of transacting business; of dealing with the public, and of securing the co-operation of his aids. It would take a year or two to cover the entire field, but the start is the important thing, and it is good to know that this has been made.

Oscar Hedmand, Telegraph Messenger

An automobile supply company doing business in Seattle, Wash., sent in a call for a messenger boy from a nearby Western Union telegraph office. The boy who answered the call arrived at the customer's showrooms promptly, was handed the telegram for transmission, and immediately started for the door. Those employed in the office paid no attention to the lad after he had been handed the telegram. In a moment, however, the boy was back at the desk of the gentleman who handed him the message, where he laid down a ten-dollar bill which he had picked up just inside the entrance door—stating, simply, where he had found it. This done, he was off with his message to the telegraph office. This is all of the story that is really important.

There seems to be something about the telegraph business in Seattle which attracts to it the sort of boys who do these things. If something is done to hold these boys in the telegraph business—that is, to provide them with opportunity and periodical advancement, the supply of messenger boys who become general managers of telegraph companies will be maintained.

Oscar Hedmand may be one of these.

Nine Hundred Consecutive Issues of Telegraph and Telephone Age

The present issue (November 16, 1920) of TELEGRAPH AND TELEPHONE AGE registers the nine hundredth consecutive issue of this journal. As there have been two issues per month, this represents continuous regular publication over a period of thirty-seven and a half years.

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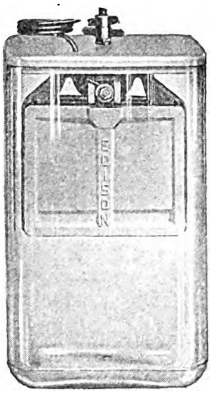
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



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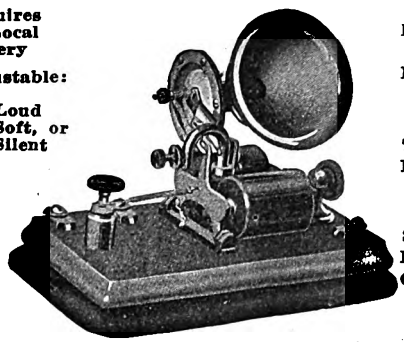

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THE RAILROAD
TELEGRAPH AND TELEPHONE

C. E. BAXTER has been appointed telegraph and telephone engineer of the Michigan Central Railroad, effective November 1, with headquatrers at Detroit, Mich. Mr. Baxter is a 1917 electrical engineering graduate of Purdue. Since graduation he has been employed by the Michigan State Telephone Company, with the exception of thirteen months spent in naval service.

A. A. DAWSON, on November 1, was appointed general foreman, Telegraph Department, Michigan Central Railroad, with headquarters at Detroit, Mich. Mr. Dawson formerly was division foreman of the New York Central Railroad at Elkhart, Ind.

American Railway Association—Telegraph and Telephone Section

Committee No. 12, "Radio and Wired Wireless," J. D. Jones, chairman, held a meeting in the Board room, Pennsylvania Station, New York, on November 3. Those present were: J. D. Jones, L. B. Foley, D. McNicol, and A. R. Belmont .

R. F. FINLEY, superintendent of telegraph, New York Central Lines, Cleveland, Ohio, has been named as third vice-chairman of the Telegraph and Telephone Section, succeeding E. L. King, resigned. Mr. King leaves the telegraph department of the Southern Pacific Railroad Company to accept an official position in the operating department of the same company.

H. HULATT, chairman, Telegraph and Telephone Section, American Railway Association, was a New York official visitor on November 3.

Personnel of the Technical Committees, Telegraph and Telephone Section

In the October 16 issue of TELEGRAPH AND TELEPHONE AGE was given a list of the newly-elected officers, members of the Committee of Direction, and members of the Committee on Nominations, Telegraph and Telephone Section, American Railway Association. In the November 1 issue was given a list of the members of Committee No. 5, Telegraph and Telephone Development.

The following is a complete list of the members of the other technical committees appointed to serve during the coming year:

COMMITTEE No. 1—CONSTRUCTION AND MAINTENANCE—OUTSIDE PLANT

G. A. Cellar (chairman), general superintendent of telegraph, Pennsylvania System, Philadelphia, Pa.

E. C. Keenan (vice-chairman), general superintendent of telegraph, New York Central Railroad, Grand Central Terminal, New York.

E. A. Burkit, general foreman, Telegraph Department, Illinois Central Railroad, Chicago, Ill.

E. A. Chenery, superintendent telegraph, Missouri Pacific Railroad, St. Louis, Mo.

G. A. Dornberg, chief lineman, Pennsylvania System, Central Division, Pittsburgh, Pa.

A. W. Flanagan, general foreman, Telegraph Department, Southern Pacific System, San Francisco, Cal.

H. C. James, Jr., assistant superintendent telegraph, lines east of Paradise, Mont., Northern Pacific Railway, St. Paul, Minn.

E. Kenward, superintendent telegraph, Canadian National Railways, Toronto, Ont.

W. S. Melton, superintendent telegraph, Southern Railway System, lines west, Cincinnati, Ohio.

C. A. Plumly, superintendent telegraph, Baltimore & Ohio Railroad, Baltimore, Md.

J. C. Rankine, superintendent telegraph, Great Northern Railway, St. Paul, Minn.

W. J. Rooney, division superintendent of telegraph, Grand Trunk Pacific Railway, Edmonton, Alberta.

J. J. Ross, superintendent telegraph, Michigan Central Railroad, Detroit, Mich.

H. A. Shepard, superintendent of telegraph, New York, New Haven & Hartford Railroad, New Haven, Conn.

F. W. Smith, superintendent of telegraph, Bessemer & Lake Erie Railroad, Greenville, Pa.

L. S. Wells, superintendent telegraph and electricity, Long Island Railroad, New York, N. Y.

R. E. Chetwood (consulting member), plant engineer, Western Union Telegraph Company, New York, N. Y.

E. T. Ambach, assistant superintendent telegraph, Baltimore & Ohio Railroad, Cincinnati, O.

COMMITTEE No. 2—CONSTRUCTION AND MAINTENANCE—INSIDE PLANT

R. F. Finley (chairman), superintendent telegraph, New York Central Railroad, west of Buffalo, Cleveland, Ohio.

W. Rogers (vice-chairman), telegraph and telephone engineer, Missouri Pacific Railroad, St. Louis, Mo.

E. V. Adams, railroad sales engineer, Western Electric Co., Inc., New York, N. Y.

A. Behner, telegraph and telephone engineer, New York Central Railroad, Cleveland, Ohio.

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R. H. Corson, assistant superintendent of telegraphs, Erie Railroad, Jersey City, N. J.

C. E. Davies, superintendent of traffic, Canadian National Railways, Toronto, Ont.

E. E. Dildine, superintendent of telegraph, Northern Pacific Railway, St. Paul, Minn.

A. W. Douglas, assistant superintendent of telegraph, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

R. A. Hendrie, telephone engineer, Missouri, Kansas & Texas Lines, Denison, Texas.

John Hilbert, telegraph and telephone engineer, Union Pacific Railroad, Omaha, Neb.

O. L. McCreary, assistant superintendent telegraph and signals, Pennsylvania System, Chicago, Ill.

J. L. Niesse, telegraph and telephone engineer, Cleveland, Cincinnati, Chicago & St. Louis Railway, Indianapolis, Ind.

T. Rodger, superintendent of telegraphs, Grand Trunk Railway System, Montreal, Que.

G. R. Stewart, general wire chief, Illinois Central Railroad, Chicago, Ill.

C. H. Williamson, telegraph and telephone engineer, St. Louis-San Francisco Railway, Springfield, Mo.

C. A. Worst, superintendent of telegraph, Chicago, Burlington & Quincy Railroad, Chicago, Ill.

H. W. Drake (consulting member), apparatus engineer, Western Union Telegraph Company, New York.

Committee No. 3—Protection Against Electrolysis

B. J. Schwendt (chairman), superintendent telegraph and signals, Toledo & Ohio Central Railway, Columbus, Ohio.

A. Y. Tomlinson (vice-chairman), division operator, Pennsylvania System, Jersey City, N. J.

R. F. Hosford, American Telephone & Telegraph Co., New York, N. Y.

L. A. Lee, superintendent telegraph, Pittsburgh & Lake Erie Railroad, Pittsburgh, Pa.

J. B. Norcross, superintendent of telegraph, Maine Central Railroad, Portland, Me.

G. O. Perkins, superintendent of telegraph and signals, Chicago, Great Western Railroad, Chicago, Ill.

L. D. Shearer, superintendent telegraph, Philadelphia & Reading Railway, Reading, Pa.

S. L. Van Akin, assistant superintendent telegraph, New York Central Railroad, New York.

P. J. Howe (consulting member), construction engineer, Western Union Telegraph Company, New York.

Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits

J. F. Caskey (chairman), superintendent of telegraph, Lehigh Valley Railroad, Bethlehem, Pa.

L. Behner (vice-chairman), assistant superintendent telegraph and signals, Pennsylvania System, Pittsburgh, Pa.

W. L. Cook, president, Reliable Electric Co., Chicago, Ill.

A. W. Douglas, assistant superintendent telegraph, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

W. M. Gould, American Telephone & Telegraph Company, New York.

J. R. Larocque, chief inspector, Grand Trunk Railway System, Montreal, Que.

G. H. Mayer, superintendent telegraph, Minneapolis, St. Paul & Sault Ste Marie Railway, Stevens Point, Mich.

P. Norton, Western Electric Co., Inc., New York.

P. A. Rainey, telegraph and telephone engineer, Pennsylvania System, Eastern Region, Philadelphia, Pa.

H. W. Drake (consulting member), apparatus engineer, Western Union Telegraph Company, New York.

Committee No. 6—Message Traffic

G. D. Hood (chairman), superintendent of telegraph, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

H. C. Chace (vice-chairman), superintendent of telegraph, Atchison, Topeka & Santa Fe Railway, Topeka, Kan.

F. E. Bentley, superintendent of telegraph, Terminal Railroad Association of St. Louis, St. Louis, Mo.

J. H. Brennan, superintendent of telegraph, St. Louis-San Francisco Railway, Springfield, Mo.

P. F. Frenzer, superintendent of telegraph, Union Pacific Railroad, Omaha, Neb.

J. G. Gilgrist, assistant superintendent telegraph, Cincinnati, Cleveland, Chicago & St. Louis Railway, Indianapolis, Ind.

A. P. Linnell, traffic supervisor telegraphs, Grand Trunk Railway System, Montreal, Que.

J. Mathews, telegraph manager, Gulf, Colorado & Santa Fe Railway, Galveston, Tex.

E. M. Pence, assistant superintendent telegraph and signals, Pennsylvania System, Southwestern Division, St. Louis, Mo.

M. O. Scobee, superintendent of telegraph, El Paso & Southwestern Railway System, El Paso, Tex.

F. T. Wilbur, superintendent telegraph, Illinois Central Railroad, Chicago, Ill.

E. Entelman, superintendent telegraph, Southern Pacific Lines, San Francisco, Cal.

Committee No. 7—Inductive Interference

L. Behner (chairman), assistant superintendent telegraph and signals, Pennsylvania System, Central Division, Pittsburgh, Pa.

Stanley Rhoads (vice-chairman), telegraph and telephone engineer, New York Central Railroad, New York.

C. S. Dow, telephone supervisor, New York, New Haven & Hartford Railroad, New Haven, Conn.

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L. P. Ferris, engineer, American Telephone & Telegraph Company, New York, N. Y.

I. C. Forshee, electrical engineer, Telegraph Department, Pennsylvania System, Philadelphia, Pa.

W. A. Jackson, assistant superintendent telegraph, Michigan Central Railroad, Detroit, Mich.

R. W. Mastick, transmission and protection engineer, The Pacific Telegraph and Telephone Company, San Francisco, Cal.

J. W. Milnor (consulting member), Western Union Telegraph Co., New York.

COMMITTEE No. 8—EDITING

Secretary of the Division (chairman), 75 Church St., New York, N. Y.

J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad, Bethlehem, Pa.

L. S. Wells, superintendent telegraph and electricity, Long Island Railroad, New York.

COMMITTEE No. 9—FUTURE ACTIVITIES AND TOPICS

W. H. Hall (chairman), general superintendent telegraph, Missouri, Kansas & Texas Lines, Denison, Tex.

G. A. Cellar, general superintendent telegraph, Pennsylvania System, Philadelphia, Pa.

R. F. Finley, superintendent telegraph, New York Central Railroad, west of Buffalo, Cleveland, Ohio.

B. J. Schwendt, superintendent telegraph and signals, Toledo & Ohio Central Railway, Columbus, Ohio.

J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad, Bethlehem, Pa.

J. A. Jones, superintendent telegraph, Southern Railway System, lines east, Charlotte, N. C.

G. D. Hood, superintendent of telegraph, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

L. Behner, assistant superintendent telegraph and signals, Pennsylvania System, Central Division, Pittsburgh, Pa.

I. C. Forshee, electrical engineer, Telegraph Department, Pennsylvania System, Philadelphia, Pa.

Stanley Rhoads, telegraph and telephone engineer, New York Central Railroad, New York.

J. D. Jones, superintendent telegraph and signals, Pennsylvania System, Philadelphia, Pa.

It will be noted that this committee consists of the chairmen of all standing committees, who are fully acquainted with all acitivities of the Division. The first vice-chairman to be chairman of this committee. In his absence, the second vice-chairman will act.

COMMITTEE No. 10—TECHNICAL TRAINING

I. C. Forshee (chairman), electrical engineer, Telegraph Department, Pennsylvania System, Philadelphia, Pa.

P. F. Frenzer (vice-chairman), superintendent of telegraph, Union Pacific Railroad, Omaha, Neb.

A. W. Sine, assistant superintendent telegraph, Atchison, Topeka and Santa Fe Railway, Topeka, Kan.

J. L. Niesse, telegraph and telephone engineer, Cleveland, Cincinnati, Chicago & St. Louis Railway, Indianapolis, Ind.

W. E. Bell, assistant to manager of telegraphs, Grand Trunk Railway System, Montreal, Que.

A. W. Douglas, assistant superintendent telegraph, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

COMMITTEE No. 11—TELEPHONE TRANSMISSION

Stanley Rhoads (chairman), telegraph and telephone engineer, New York Central Railroad, New York.

A. W. Beauprie (vice-chairman), assistant superintendent telegraph, Southern Railway System, Charlotte, N. C.

J. H. Ditch, chief telephone inspector, Pennsylvania System, Altoona, Pa.

E. V. Adams, railway sales engineer, Western Electric Co., Inc., New York.

COMMITTEE No. 12—RADIO AND WIRED WIRELESS

J. D. Jones (chairman), superintendent telegraph and signals, Pennsylvania System, Eastern Region, Philadelphia, Pa.

A. R. Belmont (vice-chairman), assistant engineer, Boston & Albany Railroad, Boston, Mass.

D. Sarnoff, commercial manager, Radio Corporation of America, New York, N. Y.

L. B. Foley, superintendent telephone, telegraph and wireless, Delaware, Lackawanna & Western Railroad, New York, N. Y.

D. McNicol, editor, TELEGRAPH AND TELEPHONE AGE, New York.

Colorado and Southern Railroad Uses New Rates to Improve Its System

Some of the railroads are beginning to use their increased rates for good purposes. The Colorado and Southern Railroad has just awarded a contract to the Western Electric Company which will bring its train dispatching system up to the last minute in efficiency. The order for new dispatching apparatus is the largest order the Western Electric has received from any railroad since the carriers were released from Federal administration.

The improvements on the Colorado and Southern will be made on its lines running from Denver to Fort Worth and from Denver to Cheyenne. They call for the installation of 65 dispatching stations and 493 miles of connecting apparatus. The new system will be one of the best equipped in the United States.

METHODS OF COMMUNICATION: Telegraphy, telephony, tell-a-woman.

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SUBMARINE CABLES

J. F. RICHARDS, superintendent of the Western Union cable station at Miami, Fla., has gone to Hearts Content, Newfoundland, on a short vacation.

A. E. POWELL, heretofore plant manager of the Western Union Cable System, London, England, has been transferred to New York as general plant manager.

GUY H. RIDGE, cable engineer, Western Union Cable System, has gone to the Miami, Fla., cable station on a business trip.

Direct United States Cable Company

The transatlantic cable of the Direct United States Cable Company, laid in the year 1880, and which has been operated by the Western Union Telegraph Company since 1912, is likely soon to pass under the control of the British government. The cable extends between Ireland and Newfoundland, thence to Halifax, Nova Scotia.

The annual report of the company recently sent out to the stockholders contains the following paragraphs:

"When the High Court gave a decision adverse to this company in its action against the Western Union Telegraph Company, an appeal was at once entered, but this was stayed by mutual consent with a view to some arrangement being arrived at between the two companies for a continuance of the lease. The directors regret that these efforts were not successful, the ultimate proposals of the Western Union Telegraph Company being of such a nature as to preclude the board from recommending their consideration by the shareholders.

"An offer has, however, been received from H. M. Government for the purchase of the company's cable as laid, its properties, equipment and stock cable.

"The directors recommend the shareholders to sanction the acceptance of this offer, which they estimate will, after discharging the company's liabilities, permit of a payment being eventually made to the shareholders of at least £6 per share.

"The board believe that the income to be derived from the existing securities and the interest upon the purchase consideration to be received from the government will permit the payment of a dividend of about 4 per cent. per annum until the company is finally dissolved.

"The directors desire to express their sympathy with the shareholders in the difficult conditions they have been called upon to face during the past eighteen months, and to congratulate them upon what they feel must be regarded as a satisfactory termination of a trying period of suspense."

CANADIAN ITEMS

Great North Western Telegraph Company

THE WORK of co-ordinating the services of the Great North Western Telegraph Company and the Grand Trunk Pacific Telegraphs is almost completed. The additional line and office facilities and the added traffic bring added responsibility and new opportunities to the officials of the Great North Western Telegraph Company.

THE SCHOOL for multiplex attendants and testing and regulating attendants, conducted under the supervision of J. B. Thompson, has recently graduated the following students: F. Barlow, A. Densem, C. Fawthorpe, P. Glynn, A. Leonard, H. Maxwell, F. Price and M. Sharpe, of Toronto, and C. Canavan and R. Pearsall of Saskatoon, Sask. Messrs. Leonard and Pearsall are now in the Montreal office; Canavan at Winnipeg; Densem at Quebec, and the others mentioned are stationed in the Toronto office.

H. N. VANSTONE, operator in the Toronto office during the past eight years, died recently in this city. During the late war Mr. Vanstone was with the military forces in France.

H. N. YOUNG, of the operating staff, Toronto, who died in October, entered the service at Brampton, Ont., and was later employed as manager of the North Bay, Ont., office. About a year ago he was transferred to the Toronto office. He is survived by his wife and child.

GEORGE D. PERRY, general manager of the Great North Western Telegraph Company, Toronto, Ont., has attended the meetings held in Washington, D. C., preliminary to the International Communications Conference.

Telegrapher Wanted

An advertisement appeared in the New York *Times* of November 7, which read: "Large downtown bank requires the services of an experienced telegraph operator; reply in own handwriting, stating age and experience. Box ...., City Hall Station, New York."

We known many first class telegraphers who might well hesitate to apply for the place in view of the fact that penmanship is to be considered. Too many present day telegraphers do not take due pride in their product—their work.

George Wady

Inspector, C. P. R. Telegraphs, Revelstoke, B. C., Canada

George Wady, whose photograph is herewith reproduced, was born in Warwickshire, England, on October 19, 1876, and came to Canada in the year 1899. In the latter year he entered the service of the Canadian Pacific Telegraphs as groundman and climber on construction work. In 1903 Mr. Wady was appointed station lineman at Brandon, Manitoba, from which point he was trans-

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ferred to Ignace, Ont., remaining there until June, 1904. From 1904 until 1910 he served as construction foreman, and from 1910 until 1912 as general foreman of the Alberta District. On January 1, 1912, he was appointed inspector, with headquarters at Revelstoke, B. C., where he still is located.

GEORGE WADY

Mr. Wady's district includes lines through the Selkirk and Rocky Mountain ranges, where snowslides, forest fires and floods are common occurrences, and in combating the many difficulties of the maintenance incident thereto he has been particularly successful. On many occasions Mr. Wady has won the commendation of his official superiors for the promptness with which he has been able to clear line wrecks.

RADIO TELEGRAPHY

Radio Corporation of America

GODFREY ISAACS, managing director of the British Marconi Company sailed from England for New York on the *Aquitania*, on November 13, for a brief visit. He is accompanied by Sidney St. J. Steadman.

E. J. NALLY, president, recently inspected the progress of construction work at New York Radio Central Station, near Port Jefferson, L. I.

AT A BANQUET given by the General Electric Company, The International General Electric Company and the Radio Corporation of America to the delegates to the International Communications Conference, on October 19, at the Hotel Ten Eyck, Albany, N. Y., President Nally delivered an address on Communications, which was received with close attention by those present.

ELMER E. BUCHER has been appointed commercial engineer in the commercial department, with headquarters at New York. Mr. Bucher will have direct charge of sales of radio apparatus to foreign, governmental, miscellaneous and amateur fields.

G. L. USSELMAN, heretofore assistant engineer in charge has been appointed engineer in charge of the transatlantic station at Tuckerton, N. J.

J. F. MEECHAM and SCOTT COFFMAN have been appointed receiving engineers at the Lakewood, N. J., station.

P. S. LAVERTY has been appointed receiving engineer at the Chatham, Mass., station.

ALFRED THOMAS, Jr., who before the late war was station manager at Chicago, Ill., has been appointed chief operator of the Chicago district, vice L. C. Dent, resigned.

T. J. HAYDEN is engineer in charge of the station at New Brunswick, N. J.

R. T. ROSSI has been appointed construction inspector.

W. P. KELLAND is district manager with headquarters in Baltimore, Md.

WATSON SIDNEY is district manager at Savannah, Ga.

W. F. MCAULIFFE is district manager at Seattle, Wash., and R. S. PALMER, district manager at Portland, Ore.

Institute of Radio Engineers

A joint meeting of the Institute of Radio Engineers and the New York Electrical Society was held in the Engineering Societies Building, New York, on November 10, at which a paper entitled "Central Stations for Radio Communication" was presented by E. F. W. Alexanderson, chief engineer of the Radio Corporation of America.

Mr. Alexanderson described plans now under way for the establishment of radio super-stations which will greatly extend the range and reliability of radio communication.

School of Wireless Telegraphy Established in Venezuela

The decree of the Provisional President of Venezuela, establishing a school of wireless telegraphy at Caracas, was published in the Gaceta Oficial of July 20, 1920. The establishment of this school is the second step in the government's plan to maintain national employees who shall be experts in radio telegraphy. The first step was taken when scholarships were granted to three young Venezuelans who were sent to the United States to perfect their knowledge of radio telegraphy in order that they might become instructors in the government service. Present plans include the establishment of two stations for domestic service in addition to the 2-kilowatt station which has already been erected for purposes of instruction.

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WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, has been elected a member of the executive committee of the board of trustees of the American Surety Company.

E. HARVEY AND H. J. EIERMAN, of the engineering department, are in Chicago on work connected with the new main office in that city.

J. E. MEANEY, formerly district commercial manager, first district, Eastern Division, has succeeded J. N. Armstrong as manager of the main office. Mr. Armstrong has been transferred to Peoria, Ill., as manager.

WESTERN UNION POST, American Legion, has completed the first year of its existence, and celebrated its success by giving a theatre party for Post members on November 4, at Wood's Theatre, where the play "Buddies" is being presented. For the year 1921, the following have been elected officers: E. J. McCarty, commander; Robert O'Dea, vice-commander; R. E. Pedersen, finance officer; T. F. Lee, sergeant-at-arms. G. V. Hack continues as adjutant.

CHARLES GRIEBENOW, manager of the office at 166 West Washington St., New York, has been advanced to the position of district commercial manager, first district, Eastern Division.

AT SALT LAKE CITY, UTAH, the company has arranged for additional floor space to accommodate equipment extensions.

THE PUBLIC SERVICE COMMISSION, of Indiana, on October 16, authorized the company to increase intrastate telegraph rates 20 per cent. This restores the rate in effect during the war period while the Government had control of the telegraph companies.

AT ST. ALBANS, VERMONT, the company's office is to be moved from the present location in the Carr Block to quarters in the Peacock House, on Grand Avenue.

New York, Western Union

THE PASSING OF SUMMER brings a slight drop in the volume of traffic, one result of which is that annual vacation periods may be allotted those who did not get away for a rest during the summer months. Members of the operating staff now away include: Rose Hittner, Sarah Hittner, Katharine McDonald, Alice McMurty, Bella Hochman, and Blanche Diamond.

WITH THE OPENING OF THE BOWLING SEASON much enthusiasm is in evidence at 24 Walker Street. A. M. Bellis is organizing a new team, which will be composed of seasoned players. The Commercial News Department team will be composed mainly of beginners. Phil Sugar, the well known bowling coach, will aid Mr. Bellis with his team.

F. H. COOLEY, of the Commercial News Department, is enjoying his vacation in the Allegheny Mountains. John Fisher also is away on vacation.

SAMUEL MOYER and JACK CLARK are the latest recruits to the ranks of the golfers who invade the country links at week-ends and on holidays.

ALBERT E. WILGUS, who has been laid up for some weeks, is recovering satisfactorily and is expected to return to duty soon.

MISS BERTHA PIERCE has returned from her annual vacation, which she spent in the mountains.

RECENT WEDDINGS: Ford Ray and Miss Pauline Pierce; Henry Hannigan and Mrs. Fitzgerald. Mr. Ray is acting supervisor in the Morse western way division.

THE BIG ANNUAL ENTERTAINMENT of the New York Telegraphers' Aid Society will be held at the Palm Garden, on 58th Street, between Lexington and Third Avenues, on the evening of November 19. Dancing begins at 10.30 p. m. This is the premier telegraph event of the year.

Western Union, Lake Division

E. C. LAY has been appointed acting manager at Dayton, Ohio, vice C. E. Jones, furloughed.

W. E. BAXLEY has been appointed manager at Canton, Ohio, vice W. G. Bliss, who takes the position of night manager. Mr. Baxley was formerly assistant at Akron, Ohio.

STUART S. POWER, commercial agent, Detroit, Mich., and Miss Alberta M. Rikley, of the Detroit office, were married on October 6. They visited Denver, Colo., and intermediate points on their honeymoon trip.

ARTHUR H. BURR, heretofore manager of the sugar district office at Detroit, Mich., has been appointed manager of the office at East Chicago, Ind. Before leaving Detroit his associates gave him a dinner at the Fort Shelby Hotel.

JOSEPH H. LUDLOW has been appointed manager of a branch office in Detroit.

W. W. LORD has been appointed manager of the sugar district office in Detroit, vice Mr. Burr.

A FATAL ACCIDENT occurred at Detroit recently when John J. Barry, formerly chief bookkeeper, and Frank H. Dejat, Jr., formerly chief collector, were killed while riding in an automobile. The car was struck by a railroad locomotive.

MRS. H. C. HUBEL has been appointed lobby typist, vice Miss Rikley, resigned.

THE BRANCH OFFICE in the Chamber of Commerce building was moved on October 1 to 49 West Grand River Avenue, where larger and more desirable quarters were obtained.

L. E. RAGSDALE

Division Commercial Manager, Lake Division

L. E. Ragsdale, recently appointed division commercial manager of the Lake Division, with headquarters at Chicago, has had long practical experience in the telegraph field and comes to his new

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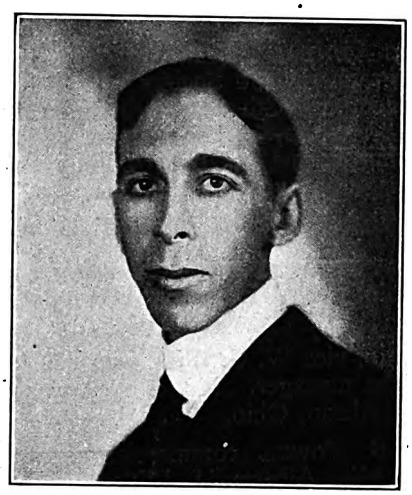
position well equipped to insure his continued success. Mr. Ragsdale was born at Bedford, Ind., in 1886, and at fifteen years of age entered the service of the Chicago, Terre Haute and Southeastern Railroad as messenger. During the following eight years he progressed through various grades of the service, including that of operator and of chief clerk to the superintendent of motive power. From 1909 to 1911 he took a law course in Jefferson Law School, Louisville, Ky., graduating with honors, and later, for two years, practiced law in his home town, Bedford, Ind.



L. E. RAGSDALE

In the year 1911 he re-entered the telegraph service and accepted the position of night manager of the Broadway branch, Portland, Oregon, remaining there until 1913, when he was transferred to Spokane, Wash., as branch office manager. In 1915 he was furloughed to accept the secretaryship of one of Indiana's State institutions at Indianapolis, Ind. Later, he returned to Western Union service and was appointed assistant chief clerk to Superintendent Boening at Detroit, Mich. Subsequently he served as manager at Pontiac, Mich., and as chief clerk to the superintendent.

POSTAL TELEGRAPH-CABLE COMPANY

C. A. COMSTOCK, assistant to the general manager, is now in Chicago on an extended business trip.

W. C. DAVIET, assistant to the general manager, is on an inspection trip covering the New England States.

P. J. FARRELL, chief operator, Boston, Mass., was a recent executive office visitor.

A. J. WARD, heretofore office electrician, New York main office, has been transferred to the office of Traffic Manager Whalen.

C. J. MOORE, city foreman, Buffalo, N. Y., has been transferred to the office of J. F. Skirrow, chief engineer.

CLARK E. DIEHL, manager at Harrisburg, Pa., has been elected a director of the Harrisburg Chamber of Commerce for the coming year.

FREDERICK W. HERZA, son of Joseph Herza, superintendent of construction, Western Division, Chicago, has received a decoration, accompanied by a citation, for gallantry in action in France during the late war.

F. S. EATON, chief operator of the Detroit, Mich., office, was a recent visitor in the main operating room, Chicago.

W. J. MACKSEY, wire chief, Detroit, Mich., has returned from his summer vacation, which he spent in Canada.

JOSEPH SMITH has been appointed all night chief operator of the office at Louisville, Ky.

W. A. SIMMS has been appointed chief operator at New Orleans, La. He was formerly chief operator of the Texas Postal at Dallas, Tex.

Chicago, Illinois, Postal

E. W. COLLINS, general superintendent, returned recently from a trip of inspection to offices in Indiana, Kentucky, Ohio and West Virginia. Later, Mr. Collins visited Detroit, Mich., accompanied by J. G. Blake, superintendent.

R. T. BAKER, manager at Detroit, Mich., was a Chicago visitor recently while on his way to Kansas City, Mo.

B. W. BELOCK, former cashier at Cleveland, Ohio, is now manager at Akron, Ohio. F. C. Maudsley succeeded Mr. Belock as cashier at Cleveland.

C. B. PRIEST, foreman, is in northern Michigan on vacation.

W. L. SIMPSON, division engineer, is supervising the work of equipping the new main office at Cleveland.

A. C. JOHNSON, assistant engineer, was in Toledo, Ohio, recently in connection with new work under way there.

H. A. SOHN has been appointed manager of the office at Beatrice, Neb., vice J. L. Higgins, resigned.

ELVERA FROSTRUM has been appointed cashier of the office at Omaha, Neb.

AT MILWAUKEE, WIS., the women employees of the office have organized the Postal Pleasure Club and will hold social affairs monthly.

MR. JOHN J. GHEGAN announces the marriage of his daughter Helen Margaret Wertz to Louis W. Bornemann at East Orange, N. J., on October 23.

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Telegraph and Telephone Age

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A Self-Balancing Morse Duplex

Novel Scheme for Reducing Attention Required at Repeater Stations.

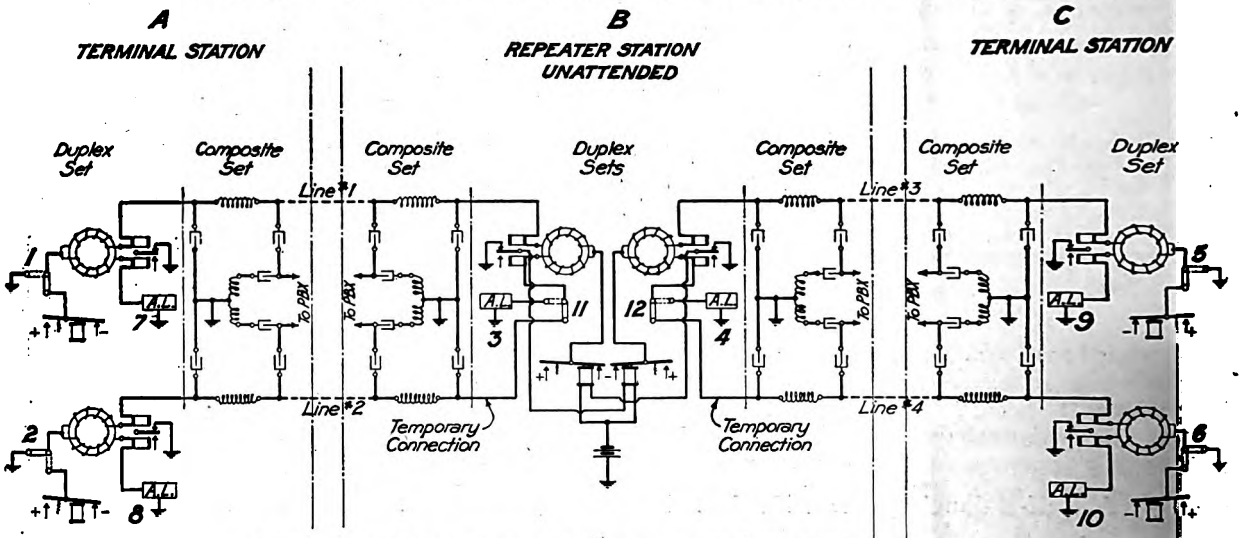
By Stanley Rhoads, Telegraph and Telephone Engineer,
New York Central Railroad, New York

A novel method of balancing a duplex has been successfully developed, making use of a real line instead of the usual artificial line resistance box and condensers which are standard equipment in duplex sets. This "real" balancing line will balance the regular line almost perfectly under changing weather conditions and will need no additional balancing at such times, and hence can be designated "self-balancing." This assumes that the balancing and duplex line are alike in characteristics; are on the same pole line; have the same length and kind of wire and in fact are twins. The two sides of a composite are very good for this type of circuit set-up, but the plan is equally applicable to any two similar circuits such as straight wires and simplexes provided they are reasonably alike in kind.

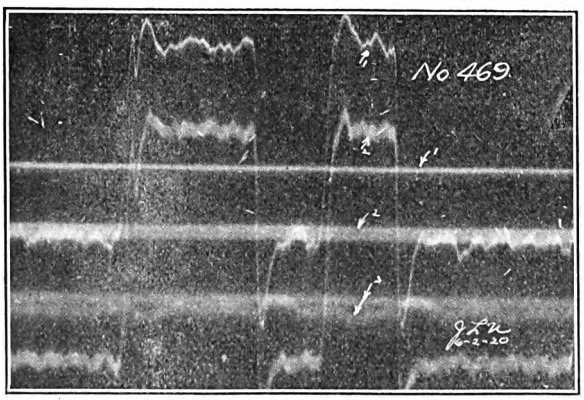
The idea suggested itself from the writer's misconception of the manner in which the telephone companies used a real line in the one-way telephone repeater, in which it was at first supposed that the second line was used to balance the first instead of using an artificial line called a network, but which later was found to be an incorrect supposition.

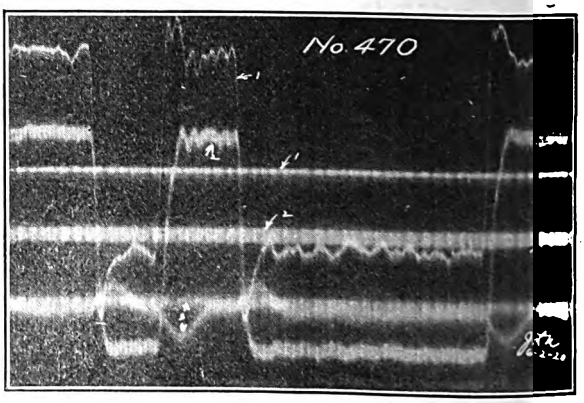
The greatest difficulty experienced in lining up a duplex is to get an adjustment of resistance and capacity in the artificial line which will so nearly balance the actual line that no "kick" will be felt in the home polar relay when the home pole-changer is operating. It is almost impossible to get such a balance. Furthermore, the balance must be changed for changing weather conditions. It is therefore unsatisfactory to work a duplex circuit that has a repeater station on it that does not have an attendant the full period of the day that the circuit is expected to give service.

This plan of self-balancing duplex is therefore especially valuable for circuits that are unattended at repeater stations for a part of the day or on



RHOADS SELF BALANCING DUPLEX APPLIED AT REPEATER STATION





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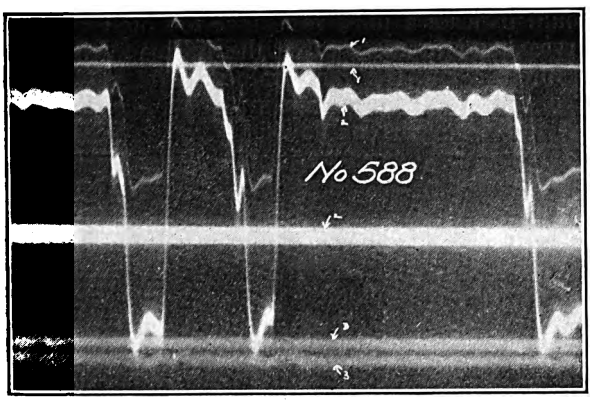
unday. It has been the custom in some instances cut the repeater out during the hours the station unattended, but this makes a long and unsatisactory wire to operate.

The plan may be considered as extravagant use f wire because it uses two wires for one duplex. is only suggested as a special expedient for use here some circuits are closed down, as many duplexes are, after business hours, at which time they an be put to productive use at night or on Sunday or the balancing of a wire that must give twenty-our-hour service.

Some oscillograms have been taken that illustrate he effect of lack of good capacity balance in the rtificial line, also some oscillograms illustrating he perfection of the balance with a real line instead of an artificial line. It should be kept in ind that in the latter the balance is continuous and nchanging, whereas the artificial line needs conınual attention.

In oscillogram No. 469, the outgoing line wave is race No. 1, while the home key is operating. The ave moves from left to right across the picture. race No. 2 is the artificial line under the best



balance that the attendant was able to obtain with he milammeter as a guide. Trace No. 3 is the wave in the polar relay of the bridge type duplex set nd shows plainly that the home pole-changer affects it considerably. Oscillogram No. 470 is the same set on the same circuit with no difference except that all the capacity was removed from the artificial line, which greatly amplifies the kick in he polar relay—trace No. 3—as would be expected. Oscillogram No. 588 shows the results with the self-balancing duplex in which it is readily apparent that the kick in the polar relay is very slight and a great improvement over the best balance that could be obtained with the artificial line. All these pictures were taken on actual working lines and are not laboratory tests.

Referring to the diagram—which indicates self-balancing duplexes applied at an unattended repeater station—it will be seen that the artificial line is cut off at switches 11 and 12, at which points the real lines to be used as balancing lines are cut on. This requires a special connection in existing sets. Terminal stations have duplex sets connected to these balancing wires. No change is made in these except to cut off the battery at the seven-point switch and put on a ground contact which is provided for in the seven-point switch. If lines 2 and 4 are regular duplexes, their regular sets are simply grounded at the seven-point switch. The resistance and capacity in artificial lines 8 and 10 can roughly approximate the values required in the artificial lines 7 and 9. This does not need to be exact, although it is just as easy to make it so as to have it inexact.

It will be seen that this set-up can be quickly arranged and it is believed that it will be well worth the trouble where circuits are idle, even if the station is attended. It gives better service and needs no attention.

THE ASSOCIATED PRESS AND AUTOMATIC PRINTING TELEGRAPHS

In telegraph circles recently there has been a considerable amount of discussion relative to the action of the Associated Press in abandoning, on September 1, the experimental operation of automatic printer service between New York and Washington, with drops at Philadelphia and Baltimore. On the date named Morse operation was resumed.

It is stated by the Associated Press that on a circuit of this character, where both ends have approximately the same amount of news to send, the automatic printer is not as flexible as Morse operation.

Milton Garges, chief of the traffic department, Associated Press, New York, in a recent announcement covering the general subject of printers, says:

"From time to time letters come from our operators showing that some of them are perturbed over the idea that they may be supplanted by the automatic printer. Other press associations have displaced many operators with machines, and it is perhaps natural that our men should have some thought that The Associated Press would follow suit. It is not our practice to follow suit. We always strive to lead. This we have done in the adaptation of automatic printers to press association work.

"Those who have been with us a sufficiently long time know that the first printer circuit ever established by any press association in the United States was the New York City delivery circuit which began operation in 1913. Since that time our Traffic Department has kept closely in touch with the development of this ingenious machine, and most of the improvements which have been made in the mechanics and operation of such circuits have been made to meet our requirements. These improvements have been many, but as yet the printer circuit has not achieved the flexibility of the Morse operated wire.

Morse Operators a Valuable A. P. Asset

"Were our problem only one of delivering a cer-

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tain amount of news in a given time to our members, the printer circuit would solve it most efficiently. But when it comes to the gathering in of news, the exchange of it on a given circuit, other problems are encountered, and, frankly, the automatic has not as yet presented an answer to these.

"There is a valuable asset in our operators which we do not wish to lose. In many instances the operator is the connecting link between the member and the administrative officials. He has in innumerable cases proved his value to both. His alertness and loyalty have had much to do in weaving our service into the fine fabric which we believe it is.

PRINTER USEFUL AS A COMPLEMENT TO MORSE

"The printer is useful; it can carry a great bulk in a given time. But its limitations are such that, so far as The Associated Press is concerned, it has not been found practicable to operate it on single wire circuits.

"As a complement to a Morse wire its usefulness is recognized, and we will undoubtedly have many such circuits, but, for the present at least, it is not expected to extend the operation to single circuits; where it is possible to obtain competent operators.

"As it is not feasible to operate part printer and part Morse on a given circuit, one way our telegraphers can help themselves is by helping to develop Morse men."

A Testing Instrument for Telegraph Linemen's Use

At the Winnipeg meeting of the Telegraph and Telephone Section, American Railway Association, the importance of the subject of instruments of precision was advanced by the Special Committee on Future Activities, in its report. This in connection with the portion of the report of Committee No. 5, dealing with the subject of welding iron wire joints, presents for the consideration of telegraph and telephone superintendents possible improvements in balance and conductivity conditions of communication circuits when wire joints are so made that no additional or variable resistance is introduced in the circuit.

The detection of variable or abnormal resistance in a circuit may be made from terminal offices by means of current meters or bridge sets, but the definite location of and elimination of high resistance at wire joints is largely in the hands of linemen.

A lineman detailed to locate and correct bad spots in a line works in the dark unless he is provided with an electrical indicating instrument of some sort by means of which he may investigate the conductivity of sections of wire containing joints. An instrument to meet the requirements must be small, rugged, and give direct readings which tell the whole story. Also, the instrument should be of general usefulness at terminal offices when not needed on outside line work.

An instrument which accomplishes these ends has recently been developed and plans are under way looking toward manufacture in quantities. The instrument is of the general type of the Weston instrument-table milliammeter.

In making a test of the condition of a joint the line current actuates the instrument without stopping operation of the circuit. The two leads from the meter are attached to the wire, one on each side of the joint; the instrument winding forming a shunt circuit around the joint. If the wire joint is defective the pointer will indicate the amount of current flowing through the shunt—or known resistance. Knowing the current value in the operating circuit (this information can be obtained from the wire chief, or learned by the lineman himself by inserting the meter in series with the line at the terminal station or at a way station near the scene of his investigations) the current passing through the shunt and the joint will be inversely proportional to their resistances. In this manner an exact measurement of the joint resistance may be made.

In making tests no calculation is necessary, since even a slight deflection of the instrument pointer would indicate a joint resistance too high for good service, and in most cases the lineman would not be interested in the exact value of the joint resistance, but would make repairs when the shunt circuit indicated current flowing.

If, however, exact resistance figures should be required in any case, a set of permanent tables for ordinary line currents could be easily prepared by the wire chief from which linemen could read the resistance values corresponding to any observed deflection of the pointer.

It would appear that the development of this simple testing instrument will give linemen, unfamiliar with bridge sets, a device which they can use to advantage and which they can understand.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy, from

TELEGRAPH AND TELEPHONE AGE
253 Broadway, New York.

IN THE STATE OF WISCONSIN the telegraph companies have been assessed $81,972.50 taxes for the coming year. Last year the three telegraph companies operating in the State were valued at $3,500,000 and paid $58,280 in taxes. These companies are now valued at $4,325,000.

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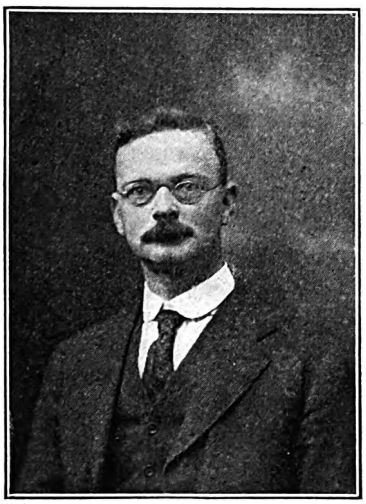
AMERICAN TELEGRAPH CONDITIONS AND SYSTEMS COMPARED WITH THOSE OF BRITISH ISLES

Mr. H. H. Harrison, of London, Now in This Country, Talks Entertainingly About His Observations Here

Mr. H. H. Harrison, well known to American telegraph engineers because of his work in connection with the development of telegraph printers, and for many years connected with British Post Office telegraph service, is now in the United States on a trip of investigation. Mr. Harrison is chief engineer of the Automatic Telephone Manufacturing Company, London.



H. H. HARRISON

When asked about the condition of the Morse telegrapher in England as compared with the conditions surrounding the American Morse operator, as he has observed them, Mr. Harrison stated that it is difficult to make informing comparisons because in the British Isles the bonus and premium systems of operation are not employed. "American operators," said Mr. Harrison, "send at a gait which sounds very rapid to the English ear, but American operators seem to copy at high speeds with the utmost ease, and although the English telegrapher is rather secure in his position because of government ownership and civil service rules, he is thoroughly capable and can work rapidly when occasion demands."

COMPETITIVE TELEGRAPHY

With reference to the maintenance of competitive telegraph systems, Mr. Harrison said: "The policies of the two big telegraph systems here seem to be widely divergent. They run parallel only so far as excellent service is given between the main cities of the country. The great distances in America force the use of the telegraph on the business community to a far greater extent than is the case in England. The companies here also study the matter of increasing the telegraph business by adding auxiliary aids to the telegraph service consumer, and this certainly would not be the result with government ownership; and probably not also if the telegraph business were conducted by a single administration minus the stimulating effect of competition."

Mr. Harrison believes also that competitive telephony has been beneficial in this country. He says: "Competition in the telephone field has been beneficial in raising standards of equipment and service, and finally has resulted in the tendency to adopt machine switching telephone systems heretofore available only in 'independent' areas."

DOUBLE-CURRENT MORSE SYSTEM

When asked the question, "What has Europe in the way of telegraph systems which are not in use in America and which might be employed here to advantage?" Mr. Harrison replied: "In Europe the open-circuit double-current Morse system is used very widely with the result that our circuits have a larger margin of operation before reaching the breakdown or failure point. Also, our outdoor construction is more solidly carried out and is more pleasing to the eye."

The visitor from abroad finds in large American telegraph offices many apparatus and equipment units which are attractive. The all-metal construction of repeater tables as used in the United States impressed Mr. Harrison as a desirable improvement, although he has noted in some instances a tendency to crowd too much equipment into small space. Abroad there is more foot room and aisle space.

SEMI-AUTOMATIC TRANSMITTERS

With reference to the use of the semi-automatic Morse transmitters so widely employed by operators in America, Mr. Harrison said: "The sending machines are not used in England at all. The continental code does not offer the same advantages as the Morse code in this respect. Although, after observing the seemingly effortless sending of Morse telegraphers here, I think the machines could be usefully employed in England. So far as the Continent is concerned, there is perhaps not enough Morse working there to warrant the introduction of the machine transmitter.

SIMULTANEOUS TELEGRAPHY AND TELEPHONY

"The additional use of wire plant by means of composite and simplex superposition is used only to a limited extent in England, except on the trunk railroads, where full advantage is taken of the possibilities of the systems."

RECENT TELEGRAPH DEVELOPMENTS

With reference to recent telegraph developments in this country, including the carrier wave system, Mr. Harrison says:

"The loop method now being introduced on your cable circuits and the frequency selective methods coming into use could be usefully added to British systems. The carrier wave multiple telephony will

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grow slowly owing to the large amount of cable in our telephone circuits. Until the high frequency cable with negligible losses from dielectric hysteresis appears, the new system cannot be expected to do great things. The German Administration is doing a lot of work in this direction and has freely published the results so far obtained."

Staff Training

Americans have often observed that in Europe they appear to have greater success in making technical students of a larger proportion of the telegraph and telephone workers than is so in America. On this subject Mr. Harrison has the following to say:

"Encouragement to students of the technical side of telegraphy and telephony takes two forms. The wealthy City Guilds of London have for many years made grants for prizes to successful students in various technological subjects. Also, the possession of certificates of technical proficiency enables the students to obtain higher salary increments. Furthermore, our telegraph literature appears to me to be more abundant and better written than is the case on this side. It is difficult to understand why this is so, because the state of the art here is such that there is room for wide dissemination of telegraph knowledge, and I should have expected to find a much larger group of writers qualified to do this work. In our country we have the *Journal* of the Post Office Electrical Engineers, which deals quite deeply with telegraph and telephone matters, and it is rather surprising that you have no similar journal here."

Interchange of Technicians

Mr. Harrison's attention was called to the fact that American communication companies and manufacturers employ experts from England, placing them where they may progress and become fixtures in the organizations, while there is no record of American engineers being invited to seek service in England. On this subject Mr. Harrison has the following to say:

"Interchange of this sort is always beneficial. While you have many cable men on this side it is a curious fact that most of the important contributions to the art of cable telegraphy have come from our side. The Brown relay and shunt; the Heuertley magnifier; the Morse and cable code printer and the application of Gulstad's methods to long cables, all had their origin in England. The art of communication as developed on this side of the Atlantic is both instructive and stimulating to the English engineer, and the kindly and generous reception accorded him on all sides calls for gratitude. With regard to what American engineers might find on the other side it may be said that there is perhaps more of finish and polish of apparatus, but rising costs may soon force us to stick closer to utilitarian requirements. In the United States I have noted a considerable amount of rough and ready construction. Low first cost is the object, of course, but it is well to keep in view that maintenance and replacement costs are lower when all work is standard and high grade.

"The staff accommodations in the large American modern telegraph offices is beyond all praise. The public rooms are models and make most of the large European offices seem dingy in comparison."

A Long-Lived Morse Key

J. F. Fadenhauer, manager of the telegraph office at the Jersey City terminal, Lehigh Valley Railroad, recently requisitioned from Superintendent of Telegraph J. F. Caskey, a new finger-knob for a Bunnell telegraph key in service in that office. His report was that the old knob was worn out, and as evidence of this the defective part was enclosed with the requisition. Inspection showed that the hard-rubber knob had been worn thin. Inquiry developed the fact that the key had been in continuous service in the Jersey City office throughout a period of twenty-two years. Fitted out with a new knob the old key may continue to serve for another generation.

Morale

On the whispering circuit behind the scenes in most large organizations one frequently hears it stated that the morale of the employees has been "shot to pieces." In some cases the report reflects the existing conditions, but more often it reflects the views of an individual only. Even in those instances where low morale exists as a result of temporary lack of ability and vision at the top the man with an eye to the future realizes that opportunity is at hand. Steadfastness, and a desire for the prosperity of the undertaking with which one is identified constitutes morale.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

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From TELEGRAPH AND TELEPHONE AGE

253 Broadway, New York

The Boston, Mass., Office of the Western Union Telegraph Company handles, during the summer months, 80,000 telegrams per day, and during the rest of the year an average of about 60,000 telegrams per day.

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Radio Telegraphy

Radio Corporation of America

O. D. YOUNG, chairman of the Board, entertained Godfrey C. Isaacs, managing director of the British Marconi Company, at dinner at the Lotus Club, New York, November 26, on the eve of Mr. Isaacs sailing for England on the *Olympic*.

GEORGE W. HAYES has been appointed traveling representative of the Radio Corporation of America.

SIX MEMBERS of the Swedish delegation to the International Communications Conference recently visited the Marion, Mass., station of this company, under the escort of E. F. W. Alexanderson, chief engineer.

R. A. Weagant Wins Liebmann Prize

At the November meeting of the Institute of Radio Engineers, Roy A. Weagant, consulting engineer of the Radio Corporation of America, was awarded the Liebmann Memorial Prize for important contributions to the art of radio communication during the past several years. The Liebmann prize is awarded annually and consists of the interest on the sum of $10,000.

Institute of Radio Engineers

At the December 1 meeting of the Institute of Radio Engineers, in the Engineering Societies Building, New York, a paper is to be presented by R. A. Heising, of the Western Electric Company, on the subject "Modulation in Radio Telephony." The various methods of modulation employed in radio telephony will be considered and their use theoretically and practically discussed. The application of one of these systems in the Arlington long distance radiophone tests will be described.

Radio Club of America

A meeting of the Radio Club of America was held at Columbia University on the evening of November 26, at which Walter E. Lemmon presented a paper entitled "Resonant Converter—Its Application to Vacuum Tube and Spark Transmitters." Models of the invention were shown in operation.

Institute of Radio Engineers, Seattle, Wash., Section

Albert Kalin, instructor of electrical engineering, University of Washington, is chairman; C. E. Williams, laboratorian, U. S. Navy Radio, Puget Sound, secretary, and W. A. Kleist, of the American Telephone and Telegraph Company, treasurer, of the Seattle Section, Institute of Radio Engineers.. Robert H. Marriott, a manager on the Board of Direction of the Institute, is now radio material officer, 13th district, Navy Yard, Puget Sound.

Federal Telegraph Company Applies for Authority to Cover Further Financing

The Federal Telegraph Company, operating on the Pacific Coast, on October 30 applied to the Railroad Commission of California for permission to issue $500,000 eight per cent. serial gold notes payable in equal annual installments of $100,000 each.

The proceeds will be used to construct four wireless stations, at Portland, Ore., Palo Alto, Los Angeles, and San Diego, Cal.

The company has been using the lines of the Pacific Telephone & Telegraph Company for transmitting messages received at its South San Francisco wireless station. The arrangement under which this transmission was carried on is soon to terminate.

The Federal Company says that in 1917 it was transmitting telegraphic messages in excess of 21,000 a month, and that since that time this number has increased to an average of 50,000 a month.

Progress of Wireless Telegraphy in South Africa

At the annual congress of the Associated Chambers of Commerce of South Africa, held at Port Elizabeth during the week of September 20-26, 1920, considerable discussion took place relative to the erection of commercial wireless stations at the principal ports between Cape Town and Durban. It was pointed out that this was most essential, not only for the proper protection of shipping, but in view of the rapid expansion of the ports.

One of the delegates stated that during the war the Admiralty erected a very powerful station at Port Nolloth (on the Atlantic coast and north of Cape Town), and that no commercial set was allowed to operate within a certain radius of this station. This station, it was stated, was about to be dismantled, and it was suggested that a commercial station be erected at Walfish Bay, South West Africa Protectorate, to fill the gap. Such additional station would relieve some of the congestion on the land lines.

The Acting Postmaster General of the Union of South Africa in the course of his remarks referred to the British Empire wireless scheme, which the Union Government is taking into consideration. He stated that powerful stations had already been erected at Oxford and Cairo, and the next would be erected at Nairobi, Kenya Colony (British East Africa). The Union Government has ac-

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quired the station at Windhuk, which was erected by the Germans and which originally was powerful enough to communicate with Berlin. This station will be put in order in the near future and will be one of the best equipped stations in the world.

The Windhuk station will be working with Oxford via Nairobi and Cairo, the scheme providing for stages of 2,000 miles each, transmission over which distance is assured. This will no doubt greatly relieve the ocean cables between South Africa and England, which are now unable to cope effectively with the existing traffic.

As far as coastal-protection installations are concerned, the Acting Postmaster General stated that, while the policy of the Union Government is to provide for coastal protection, installations at every port are not necessary. The Government will, however, soon erect several new stations to supply coastal protection.

Wireless Telegraphy at Danzig

According to the Danzig press, the Danzig telegraph office has recently installed a wireless press receiving station. These receiving stations, of which there are said to be about 120 in Germany, receive, for transmission to newspapers, press news distributed by wireless by the press services. In addition, the stations receive commercial news of the Bureau of Foreign Commerce in Berlin, intended for chambers of commerce, and also weather reports. News is sent out by the main station in Koningsmusterhausen.

The Danzig telegraph office is now operating four wireless stations: A station for the domestic telegraph service of the German wireless system; a coast station for communicating with vessels; the wireless press receiving station referred to above; and a special receiving station maintained by the Danziger Zeitung, a local newspaper, for its own messages.

The Polish authorities also possess their own wireless station, situated in the port district at Danzig-Neufahrwasser and used largely for communicating with vessels carrying government supplies. According to the press, the Polish station was specially authorized by the high commissioner and is subject to certain regulations in order to prevent interference with the operations of the Danzig, German, and British naval stations. For instance, the Polish station may communicate with Warsaw only between 1 and 3 a. m., and its conversations with vessels at sea must be confined to 10 minutes.

Specifications for Mexican Wireless Stations Available

Specifications for the radiotelegraph stations to be installed in different parts of the Mexican Republic have been submitted by Trade Commissioner Cunningham. These specifications show the desired kilowatts of power for waves of varying meters, the height of tower, type of motor, etc., and other equipment required. A copy of the specifications may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or any of the district and co-operative offices upon reference to file No. 43191.

Some Odd Wireless Calls

Among the large number of three-letter radio telegraph calls for ship and shore stations throughout the world appear the following:

VAG—Triangle Island, Canada.
RED—Libau, Russia.
EAT—Teneriffe, Spain.
LID—Faro, Recalada, Argentina.
WOP—Amercan steamship *Lake Elizabeth.*
OWL—Danish naval vessel T-7.
IMP—Italian steamship *Paraguay.*
KID—American steamship *Matinicock.*
MAD—British steamship *Musician.*
PEP—Dutch steamer *Anton Van Driel.*
PIE—Dutch steamer *Simson.*
OPR—Belgian steamer *Le Rapide.*
NUT—American steamer *Rocket.*
JAY—Japanese steamer *Anyo Maru.*
BUD—British steamer *Wearwood.*
BUG—British steamer *Norfolk Range.*

Wireless Stations in Jamaica

The wireless station at the port of Kingston is about to be enlarged and equipped with a new transmitting and receiving set which will extend the present radius of about 200 miles to a much greater one. The Direct West India Cable Co. controls this radio station.

Although the present plant is a small power, high frequency, synchronized set, estimated to work over a radius of about 200 miles and to keep continuous watch of a 600-meter wave, it is stated that occasionally messages have been received from a greater distance south of Jamaica. The hills between Kingston and waters to the north of the island make radio communication with vessels in that direction practically impossible when more than a day's distance from this port.

New RADIO Book

"ELEMENTS OF RADIOTELEGRAPHY"
By ELLERY W. STONE

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Student's Course in Technical Telegraphy

LESSON No. 17

INSULATION RESISTANCE OF TELEGRAPH LINES

In measuring the insulation resistance of a line wire the object is to determine the degree of insulation existing between the wire and the earth between two terminal stations. If the insulation is too low the operation of the circuit will be unsatisfactory and inefficient.

In this country each separate telegraph company, telephone company and railroad telegraph department uses its own method of insulation testing; there is no standard test used by all companies.

The factors involved in deciding upon a method of testing line insulation are:

Degree of insulation in megohms per mile at or above which lines must be maintained.

Whether a voltmeter or a milammeter is to be used as an indicating instrument.

Voltage to be used in making the test.

The rules of the Postal Telegraph-Cable Company call for an insulation resistance of 50 megohms per mile of line, the measurements being made with a milammeter, and an applied e.m.f. of 375 volts negative in dry weather; 110 or 130 volts negative in wet weather.

To make the test, all that is necessary is to ask the distant terminal office to open each wire as named, while the testing office connects a 375-volt negative battery (positive pole grounded) to the wire. A standard milammeter is inserted in series with the line circuit at the testing office, the deflection in degrees of the pointer being noted when the distant key is open.

Using the figures of the lower scale of the milammeter, an indication that one milliampere current is flowing through the meter means that for a wire 133.3 miles in length the insulation is 50 megohms per mile. Or, if the line is 200 miles long and the meter registers a current of 2 milliamperes, the

$$\text{insulation resistance} = \frac{375 \text{ (The voltage)}}{.002 \text{ (Current in amperes)}}$$

equals 187,500 ohms, and this multiplied by 200 (total length of the line in miles) gives an insulation resistance per mile of 37,500,000 ohms, or 37½ megohms.

The practice of the Western Union Telegraph Company, of the American Telephone and Telegraph Company and of many of the railroad telegraph departments is to use a voltmeter in series with the wire at the testing office, the insulation resistance of the wire under test being determined by means of the formula.

$$K = \frac{E-e}{e} \times Rv, \text{ where}$$

K represents the insulation resistance of the circuit, e the voltmeter deflection with the circuit open at the distant office, E the voltage of the testing battery, and Rv the resistance in ohms of the voltmeter used in making the measurement. Usually the meter has a resistance of 20,000 ohms.

CONDUCTIVITY MEASUREMENTS OF LINE WIRES

Newly appointed wire chiefs, in many instances, have some little difficulty clearing their minds as to why a distinction is made between insulation resistance and conductivity of a line wire.

The fact is that the two tests deal with the same factors—current strength, resistance and voltage; but the information gathered by making periodical insulation resistance measurements, and conductivity measurements, is in each case obtained for different purposes.

The object in making insulation measurements is to learn the condition of the glass or porcelain insulators; whether many of them are broken, allowing the line wire to come into contact with crossarms; whether the line wire is at any point in contact with trees, or with any structure which when wet with rain or dew would permit leakage of current to earth.

The object in making conductivity measurements is to determine the electrical condition of the line wire as regards joints between sections of the wire, and as to deterioration of the metal composing the line wire. A number of loose or improperly made joints in a section of line may cause an excessive increase in the resistance of the circuit, with consequent reduction of conductivity, and there are various other effects which result in a lowering of the electrical conductivity of a line.

The most accurate conductivity test is that made without using the earth as a section of the circuit, and is known as the three-wire method.

CONDUCTIVITY MEASUREMENT BY THE THREE-WIRE METHOD

The purpose of using three wires in the operations is principally to enable us to make calculations by means of a metallic circuit, and thus avoid earth currents and other foreign influences which interfere to a great extent with acurate results. Of course, this method can only be employed between stations possessing in common a number of available wires.

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Suppose, for illustration, we select three wires extending between the testing office A, and a distant station B, one of which is the wire we desire to measure for conductivity. Call these wires No. 1, No. 2 and No. 3, respectively.

First, ask Station B to loop Numbers 1 and 2. Then loop the same two conductors together at the testing station also. These two connections create a metallic circuit, a circuit possessing no connection with the earth whatever. Now connect the galvanometer and Wheatstone bridge apparatus in the circuit in the usual manner and make a note of the combined resistances of Numbers 1 and 2 conductors as indicated by the rheostat.

Next throw out No. 2 and loop Numbers 1 and 3 at both stations in the same manner and measure that circuit. Then connect Numbers 2 and 3 together and proceed as before. Having made a note of each measurement add the three results together and divide the sum by two, because each wire has now been measured twice. The actual total resistance of the three wires singly is, of course, just half the sum of the three loops formed by pairing the conductors.

Now, let us suppose that Numbers 1 and 2 looped show 3,000 ohms; Numbers 1 and 3 looped show 4,000 ohms, and Numbers 2 and 3 looped show 5,000 ohms, thus making a total of 12,000 ohms. Dividing 12,000 by two, gives 6,000 ohms, the actual total resistance of the three wires.

To ascertain the resistance of either or all of wires in turn, subtract the ascertained resistance of any two wires looped from 6,000 and the remainder will represent the resistance of the wire omitted.

Thus to ascertain the resistance of wire No. 1, subtract the result obtained when Numbers 2 and 3 were looped, from 6,000. This leaves 1,000 as the ohmic resistance of the omitted No. 1 conductor. Numbers 1 and 3 looped gave 4,000 ohms, which amount, taken from 6,000, shows that wire No. 2 possesses 2,000 ohms. In like manner Numbers 1 and 2 looped give 3,000 ohms, leaving 3,000 as the resistance of No. 3.

Where extra conductors are not available for making the measurements, approximate figures may be obtained by the voltmeter-ammeter method.

The wire to be measured is grounded at the distant station. An E. M. F., of about 125 volts is applied to the wire at the testing station, and through the medium of the springjack at the switchboard there is included directly in the circuit a milammeter. After the value of the current flowing has been noted, the milammeter is disconnected from the circuit and a voltmeter with one terminal grounded, is connected with the line contact of the springjack. The reading in volts is noted. Thus, having the current and voltage values obtaining in the circuit, the resistance may be calculated by Ohm's law, or the conductivity of the line, in ohms.

$$R \text{ equals } \frac{E}{I \text{ (in milliamperes)}} \times 1{,}000$$

The two readings, of voltage and current, should be taken, one immediately after the other, in order to minimize the probability of error.

(To be continued)

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All America Cables, Inc.

The official staff of the All America Cables, Inc., s made up as follows:

President, John L. Merrill; vice-presidents, William A. McLaren, Alexander Davidson, W. H. Coade and Jordan Herbert Stabler; treasurer, W. H. Coade; secretary, Henry De La Montague, Jr.; omptroller, G. Lincoln Jost; traffic manager, James G. Murray; general commercial superintendent, F. W. Phelan; commercial superintendent, B. H. Reynolds; manager, W. Hannah.

Branch office managers include the following: W. J. O'Brien, Washington, D. C.; J. Milne, Montevideo, Uruguay; T. E. Yates, Fisherman's Point, Cuba; W. G. H. Cross, San Juan del Sur, Nicaragua; J. R. Cotter, San Jose, Guatemala; W. J. Butterfield, Buenaventura, Colombia; J. A. Liggett, Cartagena, Colombia; J. Linford, Corocora and La Paz, Bolivia.

In Mexico, C. Mitchell is manager at Vera Cruz; A. J. Brady at Coatzcoalcos, and R. B. Silva at the City of Mexico.

In Argentina, J. R. Mendez is manager at Mendoza; S. Avila at Rosario, and J. Clark at Villa Mercedes.

In Brazil, J. T. Sheridan is manager at Rio de Janerio, and C. Ireland at Santos.

In Chili, H. B. Calder is manager at Antofagasta; J. A. Thomas at Arica; W. H. C. McConney, at Iquique; C. F. Skinner at Santiago, and W. B. Stevens, at Valparaiso.

In Ecuador, L. Meza is acting manager at Esmeraldas; G. A. Powell, manager at Guayaquil, and O. Wiseman, at Santa Eleana.

In Panama, M. L. Cordua is manager at Balboa, C. Z.; W. Brustmeyer, at Colon, and A. Lasen at Panama City.

In Peru, F. R. Crowther is manager at Barranco; R. D. Ruzo at Callao, A. S. Baker at Lima, and . H. Hooper at Paita.

A. T. Webster is traffic manager at Galveston, exas; C. E. Cummings, superintendent at the City f Mexico; H. Hussey, superintendent at Buenos ires; J. B. Smith, superintendent at Valparaiso, nd W. S. Buchanan, general representative at Rio e Janeiro.

H. Pescod, manager of the Balboa, C. Z., station, as been appointed traffic controller.

A. B. Crossman has been appointed traveling spector of apparatus and equipment.

F. W. Phelan, general commercial superintendnt, returned recently from Boston, where he went n a business trip.

B. H. Reynolds, commercial superintendent, reently attended a meeting of the National Marine eague in Chicago, where he met a number of oldme business and telegraph friends. While in Chicago Mr. Reynolds was invited to address a body of students from various educational institutions on the subject, "The Future Possibilities of a Telegraph Career."

The Bowling Team which the All America staff has entered in the Funnel League is developing satisfactorily under the captaincy of F. A. Pirie. A tournament is now under way.

The Electrical Equipment at the company's hut at Manhattan Beach, Long Island, is working successfully under the management of A. Cunningham.

The 2,500 Copies of the *All America Review,* issued in October were so quickly taken up that the supply ran out before all who requested copies had been supplied.

C. H. Tranfield, superintendent, Western Union Cable System, Hearts Content, Newfoundland, has preserved some valuable relics of the laying of the first successful transatlantic cable. Mr. Tranfield's father, F. T. Tranfield, was identified with the work of laying the 1866 cable. One of the valuable documents which have been preserved is the first message transmitted from Hearts Content to Valencia, Ireland. The sender of the message was E. Weeden, at Hearts Content, the receiver at Valencia being Mr. Tranfield, senior. It was dated July 31, 1866. F. T. Tranfield is now retired and lives in England.

Cable Service With Germany

Following a meeting of the board of directors of the Western Union Telegraph Company, it was announced November 16 that arrangements have been completed with the German Telegraph Administration for the handling of cable traffic between Germany and the United States.

In order to facilitate the large volume of traffic which is expected to develop, it is understood that plans are under way for the laying of a direct cable between Germany and the United States.

Cable Staff Transfers

Pacific Cable Board: D. C. Macrea, Fort William to Montreal; S. Black, England to Montreal; C. D. E. Greville, England to Fort William; R. E. Noble, England to Halifax; J. H. O. Jarand and H. H. Hollingsworth, England to Montreal; W. J. Weston, Montreal to Fort William; J. P. Walker, Suva to Fanning Island; H. E. Sprague and R. V. Cotter, Sydney to Suva; L. G. Gibbes, Auckland to Suva; S. G. Ellis and L. P. Brown, Southport to Syndey; L. Cosgrove, Bamfield to Suva, and C. Boult from Sydney to Halifax.

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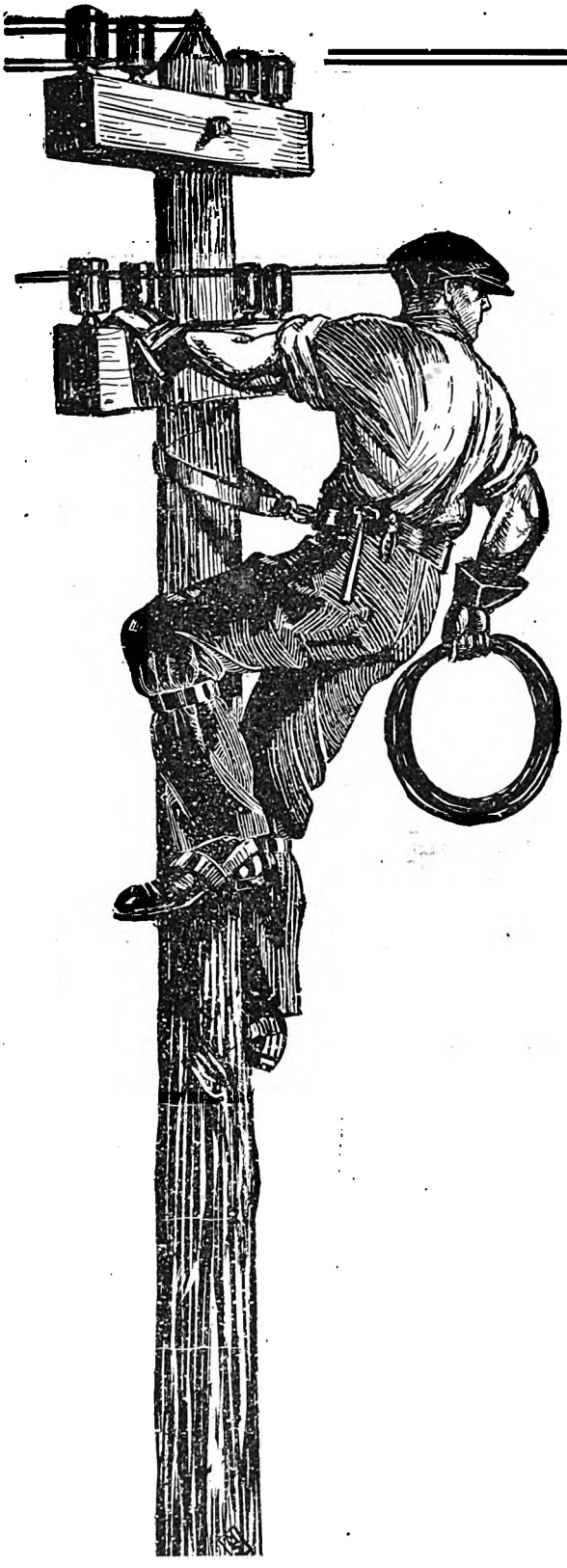

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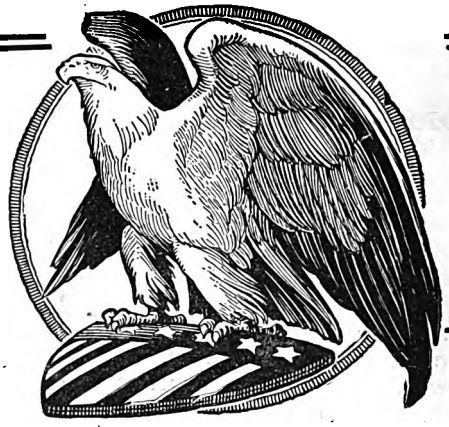
Small



BS, PORCELAIN.
Quantity, 500. Type, split 2 line. Fixed price, .048 ach. Located at Philadelphia, Pa. Order through New York City.
S. P. D. No. 1255.

PORTERS.
Quantity, 950. Type, messenger clamp. Fixed price, 12 each. Located at Ft. Wood, New York Harbor. Order through New York City.
S. P. D. 1206.

DGES.
Quantity, 13. Type, Wheatstone W. E. No. 1407. Fixed price, $80.00 each. Located at Chicago, Ill. Order through Chicago, Ill.
S. P. D. No. 3069.

EMAN'S TOOL BELTS.
Quantity, 2,144. Type, W rings and safety straps. Mfd. by Mathais Kline & Co., Chicago, Ill. Fixed price, $5.60 each. Located at Philadelphia, Pa. Order through New York City.
S. P. D. No. 3465.

EMAN'S TOOL BELTS.
Quantity, 400. Type, W rings and safety straps. U. C. G. S. D., Mfr. Buckman Mfg. Co., New York City. Fixed price, $5.60 each. Located at Ft. Wood, New York Harbor. Order through New York City.
S. P. D. No. 1010.

LS.
Quantity, 2,000. Type, wood, reinforced and braced with metal braces. Fixed price, $4.00 each. Located at Philadelphia, Pa. Order through New York City. These reels were manufactured by M. Kline & Co., Chicago, Ill.
S. P. D. No. 3504.

LS.
Quantity, 1,599. Type, wood, Barrow (payout). Fixed price, $5.60 each. Located at Chicago, Ill. Order through Chicago, Ill. These reels were manufactured by M. Kline & Co., Chicago, Ill.
S. P. D. No. 969.

E.
Quantity, 541,277 ft. Type, No. 14, B. & S. H. D.—w. pr. Fixed price, per M. ft., $13.92. Located at Army Reserve Depot, New Cumberland, Pa. Order through New York City.
S. P. D. No. 2229.

E.
Quantity, 26,060,430 ft. Type, O. D. T. P. No. 17 B nd copper clad. Fixed price, per mile, $54.304. Located at Army Reserve Depot, New Cumberland, Pa. Order through New York City.
S. P. D. No. 2230.

WIRE.
Quantity, 100,000 ft. Type, house, 36 mils, tw. pr., soft copper, each conductor A-26 (new), insulated with rubber compound and cotton braid. Coils packed in boxes. Fixed price, $9.68 per M. ft. Location, Fontana Whse., Ft. Mason, Calif. Order through San Francisco, Calif.
S. P. D. No. 13,587.

WIRE.
Quantity, 100,000 ft. Type, house, 36 mils, tw. pr. Used for interior house wiring, rubber insulation, cotton covered, slate colored with red dots. Fixed price, $9.68 per M. ft. Location, Signal Se., Army Base, Brooklyn, N. Y. Order through New York City.
S. P. D. No. 13,588.

WIRE.
Quantity, 30,011 ft. Type, outside dist. No. 17. Fixed price, $10.24 per M. ft. Location, Camp Franklin, Md. Order through New York City.
S. P. D. No. 10,150.

WIRE.
Quantity, 185,920 ft. Type, inside, tw. pr. No. 17. Fixed price, $10.24 per M. ft. Location, Camp Franklin, Md. Order through New York City.
S. P. D. No. 10,151.

LEAD COVERED CABLE

CABLE.
Quantity, 1,000,560 ft. Type, lead covered telephone, 10 pr., No. 22 ga. Fixed price, $60.32 per M. ft. Location, New Cumberland, Pa. Order through New York City.
S. P. D. No. 3550.

CABLE.
Quantity, 47,520 ft. Type, lead covered 10 pr. No. 22 ga. Fixed price, $60.32 per M. ft. Location, New Cumberland, Pa. Order through New York City.
S. P. D. No. 3550.

CABLE.
Quantity, 79,200 ft. Type, lead covered telephone, 10 pr. No. 22 ga. Fixed price, $60.32 per M. ft. Location, New Cumberland, Pa. Order through New York City.
S. P. D. No. 3550.

CABLE.
Quantity, 311,520 ft. Type, 15 pr. lead covered, No. 22 ga. Fixed price, $73.25 per M. ft. Location, New Cumberland, Pa. Order through New York City.
S. P. D. No. 3550.

nd mention M. & E. M. List No. 12, giving the S. P. D. number

had upon inquiry at these addresses.

TLANTA, GA.
RANSPORTATION BLDG.

CHICAGO, ILL.
1819 WEST 39th STREET.

SAN ANTONIO, TEXAS

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MORE AMERICAN CABLES ESSENTIAL TO MAINTAIN FOREIGN TRADE OF NATION

Lack of an adequate American cable system is a handicap to this country's foreign trade which must be removed if we are to maintain our position in the commercial world, the National Bank of Commerce in New York declares.

In its magazine, *Commerce Monthly,* the bank shows that at present American exporters are dependent for communication on commercial rivals abroad, more than half the existing cables being controlled by Great Britain alone. The spending of thousands of millions of dollars on our merchant marine and other trade organizations under such conditions, it holds, is a doubtful prospect.

"Until some effective international agreement for the neutralization of the world's cable system has been reached, the pressing need of American commerce is the extension of American cable facilities," *Commerce Monthly* says. "Without such a system American foreign trade is faced with the difficulties inseparable from doing business over a system largely owned and managed by the commercial rivals of the United States.

"Apart from the general circumstances which have increased the interdependence between business and the cables all over the world, the United States has a very special interest in the present cable situation, primarily as the result of an enormous increase in its foreign trade. In consequence, foreign market conditions have become of added importance not only to those who are actively engaged in dealing abroad, but also to a large proportion of the business community whose interests are affected less obviously, but none the less surely, by conditions elsewhere.

"The present system of international communications, largely cable, while comprehensive and efficient, has been built primarily on the basis of connecting the commercial world with the old world centres of finance, commerce and industry. National interests and prestige, competitive enterprise and local influence have governed location, extensions and combinations so that these facilities have not been in all cases arranged to be productive of the maximum efficiency or economy.

"The United States is connected with this world system, but as a contributing field to be reached and exploited and not primarily as a centre. If the United States is to maintain the position which it has won in the trade of the world, it must become the focus of a world system of electrical intercommunication. It must become one of the most important centres of communication, perhaps the most important, as it has become in many respects the centre of the world's trade and finance. Without quick, reliable communication, independent of other national interests, the vast sums we have invested in our new merchant marine and our organizations for foreign commerce will never yield full value on the investment.

"The entire cost of an American cable system which would give us direct communication with the principal commercial nations of Europe, South America and the Far East, would be a comparatively small sum compared with the cost of the newly built American merchant marine. It would give the commerce of the United States what it needs and what the commerce of the older countries already has. The spending of thousands of millions on means of transportation for American trade is a doubtful prospect as long as this country has no proper facilities for the agents who spread that trade and as long as the ships which carry it can communicate only with the consent of foreign nations, or through foreign-owned agencies.

"In certain regions present cable facilities are so congested that, apart from national considerations, new American cables would serve a pressing international need. The most acute need for additional cable facilities at the present time is in the Pacific ocean. While over the North Atlantic cables traffic has practically quadrupled since 1913 in the same period Pacific cable traffic has increased nearly nine-fold. Proposals for the laying of a new Pacific cable have been considered tentatively. The cost of the new Pacific cable is a large sum of money, but the $40,000,000 which it is estimated Japan and the United States will expend upon each of their newest battle cruisers, would probably suffice to duplicate the entire existing plant.

"British interests own and operate more than half of the cables now in use. At the present time, too, Great Britain possesses a practical monopoly of cable manufacture, which is strengthened by British control of the gutta percha market. Although far behind the British system in the point of mileage, the American-owned cables are second in importance, and connect all the American possessions, as well as the Canal Zone and the naval base at Guantanamo, Cuba, with the continental United States, thus providing the nucleus of a comprehensive American system. Next in importance at present to the American-owned cable lines is the French system. Prior to the war, Germany had developed ambitious plans for a cable system connecting the Fatherland with all the German colonies. Under the reparations section of the Treaty of Versailles, Germany was compelled to renounce on her own behalf and on behalf of her nationals all rights to the effective portion of these cables.

"The experience of the last five years has conclusively demonstrated that the amount of business which is available for the cables is limited only by the physical capacity of the lines and the ability of the operating companies to keep rates at a point which will attract business."

———o———

Increase of Spanish-French Telegraph Rates

By royal decree of August 27, 1920, the rate for telegrams between Spain and France was temporarily increased to 18 French centimes per word, beginning September 1, 1920, thus bringing the cost of telegraphic messages from Spain to Algiers and Tunis or to Spanish possessions in Northern Africa via the Chafarinas-Nemours or Cadiz-Tangiers-Oran cables to 23 French centimes per word.

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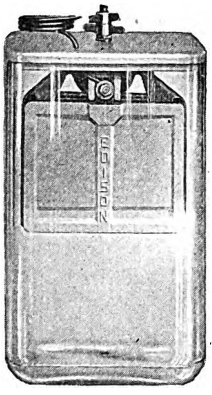
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

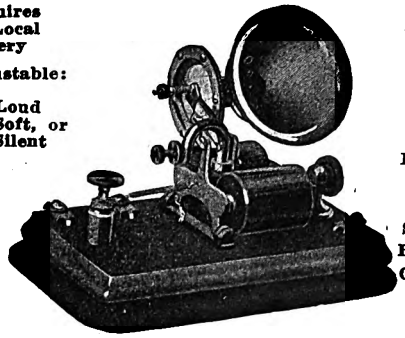
750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

Better Telegraph Service Less Expense

Requires No Local Battery

Adjustable:

Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

The Latest Improved Instantly Adjustable

DIAPHRAGM TELEGRAPH SOUNDER

The Agent of the Norfolk Southern Railroad Company at Fentress, Va., has had Diaphragm Sounders in constant use in that office for more than six years without interruption, or failure of any kind. In addition to the improved service, he has saved his company 30 zincs, 20 coppers, more than 100 lbs. bluestone, and 6 or 8 battery jars.

The Diaphragm Sounder performs better service—longer, and at less expense than any other type of sounder. Permanently solves the local battery problem.

Used by U. S. Gov't and More Than 100 Railroads, Pipe Lines and Oil Companies

Write for Folder

RAILWAYS LABOR SAVING DEVICE CO.
1108 Arlington Ave., DAVENPORT, IOWA

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

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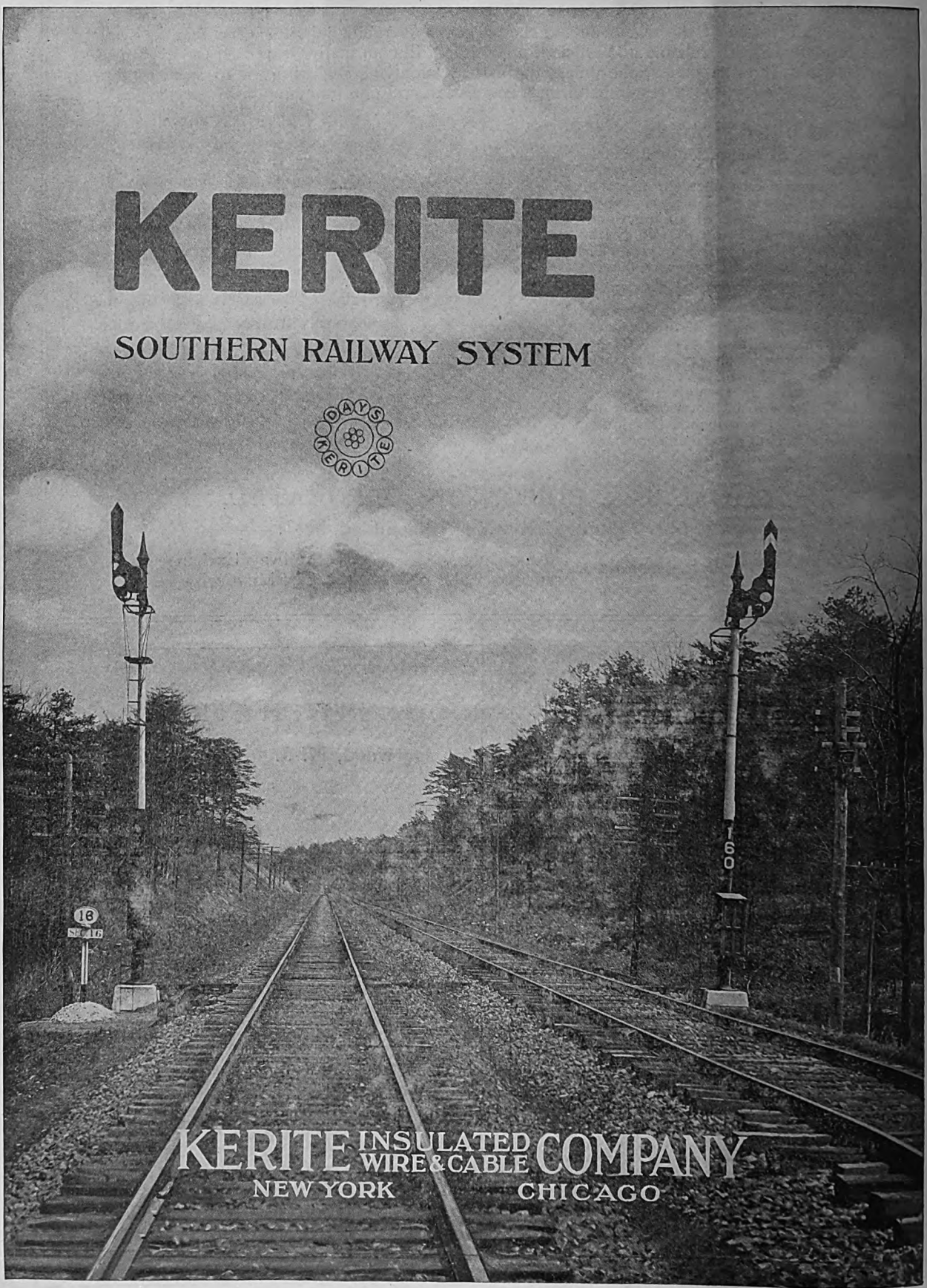

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THE RAILROAD
TELEGRAPH AND TELEPHONE

COMMITTEE 4, Telegraph and Telephone Section, American Railway Association, held a meeting in New York on November 11. This committee has in hand the subject "Protection against lightning or electric light and power circuits." J. F. Caskey is chairman, the other members being L. Behner, W. L. Cook, A. W. Douglas, W. M. Gould, J. R. Larocque, G. H. Mayer, P. Norton, P. A. Rainey and H. W. Drake.

G. A. CELLAR, general superintendent of telegraph, Pennsylvania Railroad, Philadelphia, Pa., and E. A. CHENERY, superintendent of telegraphs, Missouri Pacific Railroad, St. Louis, Mo., were in New York on November 17, attending a meeting of Committee No. 1—Construction and Maintenance, Outside Plant.

COMMITTEE No. 7, Inductive Interference, held a meeting in New York on November 16.

E. L. KING, heretofore superintendent of telegraph, Southern Pacific Railroad, San Francisco, Cal., has been appointed superintendent of the Salt Lake Division, for the same company, with headquarters at Ogden, Utah. Mr. King began his business career as a messenger boy in the service of the Postal Telegraph-Cable Company in the year 1891; later working as operator and manager for the company at various coast towns. In 1894 he entered the service of the Southern Pacific Railroad Company, and in the succeeding years advanced through the various grades of train dispatcher, chief dispatcher, and superintendent of telegraph.

D. W. KELLY, of the Portland Railway, Light and Power Company, Portland, Ore., has been advanced from the position of chief train dispatcher to train rules examiner. Mr. Kelly started his railroad career with the Minneapolis, St. Paul and Sault Ste. Marie Railroad, remaining with that company seventeen years as operator and train dispatcher. Later he worked as dispatcher for the Southern Pacific Railroad, where he was employed before identifying himself with the Portland Railway, Light and Power Company.

J. A. JONES, superintendent of telegraph, Southern Railroad, Charlotte, N. C., was a New York business visitor on November 19.

A. W. BEAUPRIE, assistant superintendent of telegraph, Southern Railway System, Charlotte, N. C., was in New York on November 24, attending a meeting of Committee No. 11, Telephone Transmission. J. H. DITCH, chief telephone inspector, Pennsylvania Railroad, Altoona, Pa., also was present at this meeting. STANLEY RHOADS, telegraph and telephone engineer, New York Central Railroad, is chairman of Committee No. 11.

A. J. GRANT
Inspector, Canadian Pacific Railway Company's Telegraphs

A. J. Grant, inspector, Canadian Pacific Railway Company's Telegraphs, Ottawa, Ontario, was born at New Glasgow, Nova Scotia, in the year 1868, and entered the service of the Western Union Telegraph Company in his home town in the year 1888. Two years later Mr. Grant was transferred to Canso, N. S., as station lineman, a year later being placed as foreman in charge of a construction crew, continuing in the service until the year 1899.

A. J. GRANT

In the latter year he entered the service of the Canadian Pacific Railway Company's Telegraphs in the line department at Montreal, Que., where within a few months he was advanced to the position of construction foreman, and later assistant superintendent of construction.

On January 1, 1911, Mr. Grant was appointed superintendent of construction with headquarters at Montreal, in which position he remained until February 1, 1915, when he was appointed inspector with headquarters at Ottawa, Ontario.

Edward Entelman
Superintendent of Telegraph, Southern Pacific Railroad

Edward Entelman, who was appointed superintendent of telegraph of the Southern Pacific Rail-

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road, San Francisco, Cal., on October 1, entered the service of the company in the year 1895 as station agent. During the succeeding seven years Mr. Entelman worked as operator and agent at various points. He was then advanced to the position of train dispatcher, and in 1906 was appointed assistant chief dispatcher, and later chief dispatcher of an important division. On June 15, 1917, he was appointed trainmaster, remaining in that position until September 1, 1918, when he was appointed assistant superintendent, in which position he remained until his recent promotion to the head of the telegraph department.

His twenty-five years' continuous service with the company gave Mr. Entelman an opportunity to acquire a vast fund of information about the company's transportation facilities and requirements—an opportunity he availed of to the fullest extent. He comes to his new position well equipped to carry on the work of his predecessor in furnishing to the executive and operating departments of the railroad telegraph and telephone service of a high standard.

THE "FARTHEST SOUTH" TRANSCONTINENTAL TELEGRAPH LINES

If you look at a map of South America you may observe that on the west coast, in Chili, is situated the city of Valparaiso, and on the east coast, in the Argentine Republic, is situated the city of Buenos Aires—one on the shores of the Pacific ocean, the other on the Atlantic. Between these two cities stretches one of the most important telegraph leads in the world—nearly one thousand miles in length. It is the land line connection which joins the city of Buenos Aires with the submarine cable lines of the All-America cables extending north along the west coast of South America to Peru, Ecuador, Colombia, Panama, and New York.

For many years past the bulk of the telegraph traffic between North American cities and South American cities has been transmitted over this line, from which it is apparent that the maintenance of uninterrupted service over the South American land lines has been of the utmost importance.

Writing recently from Buenos Aires, Mr. Marstrand, of the All America Company, has the following to say about the company's land line across the Argentine:

"All of the poles, the silent sentinels of the Argentine pampas, carry white porcelain insulators; not glass, like those used in the United States. The insulators are affixed to bolts, and these bolts are fastened to the bracket or cross-arm, which is held on to the poles by saddles or clasps. The land wire is tied to the insulator; the pole is of iron and probably made in two or three pieces, and carries a lightning rod.

"These are only a few of the parts with which the line man must be well acquainted. The land-line material warehouse is full of hundreds of accessories that help to make a modern land-line system. You may see, on one of the wooden cross-arms, some metal strips nailed to it which have no connection with wires or insulators. These have been placed on the arm in such a way as to prevent birds from building their nests there and probably earthing the line. The oven-birds, or horneros, that make their nests entirely of mud in remarkably quick time; birds that build nests of sticks and wires; and, in fact, any birds inclined to locate their homes upon the telegraph arms, are prevented from so doing by these strips. Owing to our company's up-to-date inspection, these nests would probably not be found upon our lines; but they are often to be seen upon neighboring lines.

"Birds, however, are not all that cause trouble. There is the 'straw' trouble; the spider-web nuisance; pieces of wire which are thrown on the lines, causing contacts, kites, leakage, broken insulators, lightning, rain, wind and snow; each of these can cause enough trouble to require an entire chapter in describing it, as can be seen in the correspondence of the land-line with headquarters.

"The Watch on the Line

"The land-line inspector always makes a practice of keeping close watch on the lines, when he travels on the train. If he discovers a 'contact' he stops at the hut of the nearest lineman and notifies him of the 'fault.' Should the train not stop there, he writes directions on a slip of paper, which he throws out of the window when passing the hut, with the hope that the lineman will find it.

"Upon a certain trip, the inspector was unusually attentive because there had been a heavy rainfall, preceded by the strong winds that so often prevail on the Argentine pampas. In the distance, he noticed something large and white on the top of a pole; but he could not make out just what it was—an insulator? No, too big for that, and not quite so white. He was curious. As his train approached it, and then rushed by, passing about six metres away from the object, he discerned the figure of one of his lineman in the garb of Apollo perched upon the pole. He was intent on a repair and probably did not even notice the train, so eager was he to get through.

"He explained afterwards that he could not get near the pole because it was surrounded by water of considerable depth; therefore, the only thing to do was to take off his togs and swim to it. The inspector pardoned him, but called his attention to the fact that trains usually carry passengers, and that the next time he might remember to take a bathing suit with him."

In Colombia, the State telegraph system is made up of 22,000 kilometers of line, with 700 offices. There are 2,000 employees. The expenditures for the year ending February 29, 1920, amounted to $1,275,217, and the revenue, $1,141,687; a deficit of $133,530.

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EDITORIAL COMMENT

Boys

Any random list of fifty present-day railroad or telegraph officials will show a large proportion of men who began their business careers as messenger boys or as telegraph operators. Talk to these men about their early experiences and compare the conditions under which they gained their professional footing with what appears to be expected of youths of the present time, and you will discover that a great change has taken place.

Thirty years ago a boy's entry into business generally meant that the profession initially selected was to be his life's work. The family morale and the family discipline of those days supplied something that is not so widely existent today. It may be argued that boys today are the same as they always have been, but it may be added that fathers of thirty years ago were bosses in their own bailiwicks, and the loss of a position by a boy was regarded as a matter for kitchen-table serious consideration. Many eminent gentlemen have recollections of stern measures which resulted from conferences between father and mother on these occasions. A first delinquency usually meant a visit by the father and the boy to the employer—father registering as guarantor of future good behavior. Generally a much longer period intervened before there was further misunderstanding, and any subsequent breach, handled in the same manner, served to tide the lad over a period when he was shedding illusions as rapidly as such things may be divorced without mental damage.

Father was on the job all of the time, and many a boy later in life has dedicated an important work of literature or science to a father of this sort.

In the various industries today exists a condition referred to in the rather vague term "labor turnover." So far as this condition concerns youths of from fifteen to twenty years, the term may be paraphrased to "father is no longer on the job."

Today, a much larger number of boys is being given school and college training than was the case thirty years ago. Boys attending the large colleges are subject to a discipline which in some measure accomplishes the results aimed at by the right kind of father, but while the enrollment figures of the various institutions of learning seem imposing, the fact remains that only a small proportion of the boys of the country and of the cities ever get beyond the public school stage.

For ten years past the writer has lived in one neighborhood of New York City and during that time has taken a personal interest in the welfare of many boys—in all cases boys who were likely not to have college opportunities. Quite a number of these youths have been started in the telegraph business, and in this line of work, as well as in other lines decided upon, the records show that not more than ten per cent. of the boys followed up the profession first entered. Sixty per cent. of the boys were engaged in four or more widely separated lines of work during the first two years after leaving school.

There are various reasons for these unnatural conditions, but chief among these is the lack of interest on the part of parents. In certain cases where interest is evident and sincere, there is an almost total lack of control. There are many families of three or four boys which have been brought up to manhood without acquiring any individual sense of responsibility—even for their own futures.

A half century ago there was still prevalent the indenture system whereby boys were "bound out" to learn trades. This was rather a slavish method of bringing about the desired ends, and was not nearly so satisfactory as the wholesome American system later adopted by parents whereby father realized that his sons and his colts had certain common characteristics, and required pretty much the same sort of treatment.

Large commercial industries employing thousands of young men are vitally concerned in the problem touched upon in this article. In time, something in a national way will have to be done to bring about a return to steadier gaits.

Telegraph and Telephone Age Commended

At the Winnipeg, Man., convention of the Telegraph and Telephone Section, American Railway Association, held September 22, 23 and 24 last, a resolution was unanimously adopted which read:

"Whereas, the third session of the Telegraph and Telephone Division of the American Railroad Association and the first one to be held in Canada, having been most interesting, educational and harmonious; and,

"Whereas, this having been due to a great extent to the assistance and co-operation the various committees have received from representatives of the American Telephone and Telegraph Company, The Harland Engineering Company, The Reliable Electric Company, Radio Corporation of America, TELEGRAPH AND TELEPHONE AGE, The Western Union Telegraph Company, and the Western Electric Company, Inc.; therefore, be it

"Resolved, that the appreciation of the Division for this co-operation and assistance on the part of the representatives of the companies named be heartily expressed."

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

R. S. WISHART, well known in printing telegraph circles in this country, and who has been in Paris, France, during the past two years in printing telegraph work, has returned to Chicago, Ill., where he will be identified with the engineering department of the Morkrum Company.

MANUEL BALSEIRO, telegraph engineer, of Madrid, Spain, has been appointed a delegate to represent the Spanish government at the meetings of the International Communications Conference.

W. E. STIMSON, of the China Electric Company, Pekin, China, formerly well known in telegraph circles in New York, Boston and Washington, and who was in this country on a business trip a few months ago, has returned to China. The China Electric Co. is a branch of the International Western Electric Company.

I. N. MILLER, for more than thirty years superintendent of the Western Union Telegraph Company, at Cincinnati, Ohio, and who retired from active service a few years ago, will spend the winter months at Miami, Fla.

JAMES W. LAUGHLIN, well known telegrapher of New York and other eastern cities, and who was in the service of the United Fruit Company in Central America for several years until 1917, when he joined the United States naval forces, is now located at Detroit, Mich. Mr. Laughlin is an expert radio as well as wire telegrapher.

H. I. ROBINSON, heretofore with the Universal Machine Company, Baltimore, Md., is now a member of the engineering staff of the Kleinschmidt Company, New York, manufacturers of printing telegraph apparatus.

W. H. SAWYER, well known in telegraph circles in New York in the late sixties and early seventies, and who retired from the wire manufacturing business in Providence, R. I., a few years ago, is in Pasadena, Cal., for the winter.

I. N. MILLER, JR., formerly district commercial superintendent of the Western Union Telegraph Company at Seattle, Wash., and who retired some months ago on account of ill-health, has so far recovered that he expects to be able to resume work within a short time. He is at present living at Tucson, Ariz.

P. A. JEANNE, assistant electrical engineer, Mountain States Telephone and Telegraph Company, on November 16, read a paper before the Utah section of the American Institute of Electrical Engineers, on the subject: "Inductive Interference Problems."

C. A. AGNETTI, for over five years in government telegraph service at Valdez, Alaska, is visiting New York, where his parents reside. He is accompanied by his wife.

C. M. MARRON

Assistant General Manager, American District Telegraph Company

C. M. Marron, formerly district superintendent of the American District Telegraph Company at San Francisco, Cal., has been appointed assistant general manager of the company, with headquarters in New York.

Mr. Marron has been connected with the company in various capacities during the past thirty years, and his administration of the various offices he has held has been marked by thoroughness and a close application to the interests of the company and the company's customers. In his early days Mr. Marron was a telegraph operator and at the time he accepted employment with the American District Telegraph Company was an operator in the employ of the Associated Press.

C. M. MARRON

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HARRY M. BIELE

Supervisor of Automatics, Associated Press

In the Eastern Division of the Associated Press it has been found advisable to appoint a divisional automatic supervisor to a position similar to that of divisional chief operator, with jurisdiction over the entire automatic printer operation and automatic personnel of the division.

Harry M. Biele, who has been connected with the Morkrum Company for several years, has been assigned to this position, and will have direct charge over the eighty-eight printers used and the fifty or more employees who maintain them. He came into The Associated Press service in 1914, having worked as assistant printer chief operator for the Postal Telegraph Company prior to that time. Some time later, when the Morkrum Company took over the New York City maintenance, Mr. Biele assumed charge of the service for that company.

Money Transfer Frauds

No other excursion into ways that are dark seems to get a person into the penitentiary so quickly as attempts to "beat" the telegraph money transfer service.

One Theo. Dierks, using the name of another person in New Braunfels, Tex., obtained $250.00 fraudulently. A few days later he tried it again and was nabbed so quickly that the year in prison, which the Judge awarded him, will be spent in wondering how it all happened.

Roy H. Simmons, alias Roy H. Stanley, tried the same scheme from a telegraph office at Portales, New Mexico, recently. Before he had made up his mind whether he should purchase a Sedan car or a diamond pin, the United States marshal had the thief on his way to Leavenworth penitentiary, where he will at least have shelter during the next five years.

In both of these cases the stolen money was recovered.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

COPPERPLATE reproduction of prints was introduced by Jacobi, in Russia, in the year 1838, and by Spencer, in England, in the same year.

WESTERN UNION TELEGRAPH CO.

W. G. SALE, district commercial superintendent, Richmond, Va., has returned to duty after a two weeks' illness.

BUD LLOYD has been appointed acting chief operator at Columbus, Ohio, vice H. E. Rawson, on furlough due to illness.

CHARLES H. SIMPSON, manager at Bridgeport, Conn., has resigned to enter a mercantile business at Rochester, N. Y. He is succeeded at Bridgeport by Harvey Johnson, heretofore manager at Hoboken, N. J.

T. J. SPILLANE, formerly manager at Union Hill, N. J., has been appointed manager at Hoboken, N. J.

S. B. FORBES has been appointed chief operator of the Albuquerque, N. M., office of this company, vice H. C. McNeil, transferred to the Pacific Division.

Western Union Earnings

The Western Union Telegraph Company reports September operating revenue of $10,414,304, compared with $9,083,220 for September, 1919. The net revenue after deducting expenses amounted to $1,868,190, compared with $2,171,315 for the same month last year.

Western Union Telegraph Company Establishes Purchasing Department

The Western Union Telegraph Company purposes establishing a purchasing division, which will make purchases of all commodities direct. The Western Electric Company has acted as purchasing agent for the company for the past eight years, but the contract has been terminated as of March 1, 1921. C. S. Vorhees, for twenty-five years identified with the financial and sales work of the Western Electric Company, New York, has been appointed general purchasing agent. Mr. Voorhees is forty years of age and has had a wide experience. His selection is regarded as a strong one. He will report to Vice-President Gallaher. The purchasing division is expected to function early in December.

Old Telegraph Center in Rochester, N. Y., to Be Torn Down

The Reynolds Arcade building in Rochester, N. Y., in which for many years has been located the office of the Western Union Telegraph Company, is to be torn down to make way for a more modern structure.

As far back as the year 1851, this building housed the Rochester branches of the Morse telegraph lines; the independent lines managed by O'Reilly, and the House company's lines using printing machines.

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Western Union, Eastern Division

C. F. FORDHAM, district commercial agent, first district, died on November 7, after a short illness. Interment was at Summit, N. J., on November 10.

RECENT VISITORS to the general manager's office were: G. A. Cellar, general superintendent of telegraph, Pennsylvania Railroad, Philadelphia, Pa.; C. A. Plumly, superintendent of telegraph, Baltimore and Ohio Railroad, Baltimore, Md., and L. D. Shearer, superintendent of telegraph of the Philadelphia and Reading Railroad, Philadelphia, Pa.

MISS ELSIE MILLARD, heretofore manager at Great Barrington, Mass., has been transferred to a position in General Manager Carroll's office.

C. O. FLINT, heretofore manager at Rockland, Me., has been appointed district commercial manager, with headquarters at Portland, Me.

MISS A. E. SMITH, manager of the office at Cornwall-on-the-Hudson, N. Y., died suddenly on Sunday, October 24, after a few days' illness.

New York Western Union

R. S. PURSSELL and M. N. CRAWFORD of the Post and Telegraph Department, of India, accompanied by H. P. Clausen, of the International Western Electric Company, recently were shown through the various departments at 24 Walker St.

THE WIRE CLUB OF NEW YORK, at its November regular meeting elected the following officers to serve during the year 1921: J. Gschwind, president; F. S. O'Connor, vice-president; W. E. Fleming, secretary; G. Mittag, treasurer. The board of managers consists of Messrs. H. M. Heffner, R. H. Tucker, E. D. Pitt, E. T. Burrill and E. F. Dann. The members of the auditing committee are W. R. Lawrence, G. C. Gute and H. C. Rhoades.

ASSOCIATION WESTERN UNION EMPLOYEES Local No. 80 gave its second annual dance on the evening of November 12, at 24 Walker St. The affair was well attended by members and their friends. Music was by the Imperial Orchestra.

A CHECKERS TOURNAMENT, arranged by A. W. E., Clerical Local No. 80, is now being conducted at 24 Walker St. The games are played in the men's rest room on the twelfth floor. The prizes to be awarded the winners all are handsome and useful.

WALDO O. EGE, of 24 Walker St., is spending his two weeks' vacation in his home town—Reading, Pa.

WORD HAS BEEN RECEIVED from W. R. Taylor, of 24 Walker St. office, who is now on extended furlough, of the sudden death of his father at Walkerton, N. C.

MISS FRANCES SCHOAB, of the New Orleans multiplex circuit, has announced her engagement to Louis Lasky.

JOSEPH P. KING, service supervisor, it has been announced, is engaged to Miss Martha Cassidy of the clerical force.

Telegraphers' Society Gives Successful Entertainment

The entertainment and dance given by the New York Telegraphers' Aid Society, at the Palm Garden, New York, on the evening of November 19, demonstrated that the officials, managers, wire chiefs, operators and clerks of the large telegraph companies can, upon occasion, lay aside the machinery of commercial competition long enough to renew acquaintances and to keep alive the feeling of craft fellowship.

At the big dance a Postal lady could glide gracefully around the hall with a Western Union gentleman and no one could tell which of the merry-makers represented 42,000 offices and the "big pole," or which of them was waiting for the answer to the query: "Do you ever stop to consider, etc."

The officers of the society are: Charles J. Lemaire, president; J. N. Kelley, vice-president; T. M. Brennan, treasurer; C. A. Kilfoyle, financial secretary; Mary E. Saunders, recording secretary. Executive Committee: W. J. Quinn, W. W. Price, R. G. C. Carr, J. V. Riddick, A. M. Lewis, R. J. Marrin, O. H. Brown, A. F. Kavanaugh, F. X. O'Connor, F. J. Sheridan, J. J. Keefe and E. J. Oakley.

Washington, D. C., Western Union

J. D. STEELE has resigned from the State Department and has re-entered Western Union service as a member of the testing and regulating staff.

S. B. RUSK has resigned from the service to enter the mercantile field at Baltimore, Md. W. S. Sparks relieves Mr. Rusk on the western testboard.

WILLIAM LOCKWOOD, who has been sick for several months, has recovered and returned to the service.

A. KENODE, JR., and E. A. SPEAR, who are away on sick leave, are reported recovering satisfactorily.

O. L. HOLLOWAY has been appointed repeater chief in the Washington office.

MISS ROSE CALLAN has resumed work in the Commercial News Department after three weeks' absence due to illness.

JOHN VOWLES, who has been in the emergency hospital for four weeks past, has returned to duty.

THE ASSOCIATION WESTERN UNION EMPLOYEES, Washington Local, gave a luncheon and dance on November 18, attended by 125 members. Irving Harne, president, is planning an elaborate program for the Christmas entertainment.

Western Union, Gulf Division

A. E. BARKSDALE of District Commercial Superintendent Wilson's office has been appointed acting district commercial manager, with headquarters at Houston, Texas.

W. H. MEECH, manager at Greenville, Texas,

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has been transferred to the staff of Superintendent Wilson, Dallas, Texas.

A. A. DAVIS, district commercial manager, headquarters at Dallas, Texas, has resigned to engage in other business.

MRS. PEARL CORDUA, assistant manager at Galveston, Texas, is spending her vacation at Dallas and Mineral Wells.

J. D. MCLELLAND, city superintendent, Houston, Texas, has returned from a well-earned vacation spent at El Paso.

J. W. HARPER, chief bookkeeper at Ft. Worth, Texas, has been appointed an assistant to Manager Varona, at Havana, Cuba.

RAY VAUGHAN, commercial agent, Ft. Worth, and MISS ETHEL MORRIS, bookkeeper, Ft. Worth, Texas, were married September 22. Mr. and Mrs. Vaughan spent their honeymoon in Houston and New Orleans.

T. S. EASTON has been placed in charge of the commercial news department desk in the General Office, Dallas, vice Miss Josephine McNally, transferred to a stenographic position.

MRS. J. F. VAUGHAN has been transferred to the office of J. F. Wilson, superintendent of the first district.

LEWIS SAAL, in charge of the mail bureau in the general office, and MISS AILEEN GIBBLON were married November 1. They are spending a couple of weeks at New Orleans.

THE FOLLOWING MANAGERIAL APPOINTMENTS are announced: Paul E. Teter, Breckenridge, Tex.; A. J. Gary, Brady, Tex.; H. C. Mize, Monroe, La.; Miss Addie Bradley, Navasota, Tex.; J. L. Dean, Weatherford, Tex.; Miss Mabel Lapoint, Bartlett, Tex.; Miss Theo Self, Donaldsonville, La.; J. P. Coady, Rotan, Tex.; A. M. King, Sipe Springs, Tex.; Mrs. E. L. McClure, Stamford, Tex., and E. W. Schaeffer, Strawn, Tex.

Oklahoma City, Okla.

E. E. THOMPSON, foreman, equipment department, Dallas, Tex., with a crew of installers, has completed extensive improvements in the office at Oklahoma City.

O. C. SCOTT, testboard attendant, has returned from a two weeks' vacation.

H. C. Robinson has been transferred from the traffic department to the testing and regulating department.

C. L. BUELL, of the multiplex department, has been advanced to a position in the office of the division wire chief at Dallas.

ELECTROMAGNETS were made by Sturgeon, in England, in the year 1824.

THE FIRST TELEGRAPHIC TRAIN-ORDER was sent (on the Erie Railroad) in the year 1851

POSTAL TELEGRAPH-CABLE COMPANY

W. C. DAVIET, assistant to the general manager, recently visited the offices in Boston, Bangor, Hartford, Portland, Providence, Springfield, Worcester, and other New England points.

W. G. ERNST has joined the staff of the plant and engineering department.

RECENT EXECUTIVE OFFICE VISITORS INCLUDE: E. W. Collins, general superintendent, Chicago; G. W. Ribble, general superintendent, Atlanta, Ga.; E. Kimmey, superintendent, Boston, Mass.; C. A. Richardson, superintendent, Albany, N. Y.; H. D. Reynolds, superintendent, Buffalo, N. Y.; C. E. Bagley, superintendent, Philadelphia, Pa., and H. Scrivens, superintendent, Pittsburgh, Pa.

R. B. KENNEDY has been appointed city foreman at Buffalo, N. Y., vice C. J. Moore, transferred to New York.

THE COMPANY, on November 15, authorized the acceptance of day letters for transmission over its lines.

EFFECTIVE DECEMBER 1, the message rates of the company will be restored to those in effect during the war period. The raise amounts to an increase of twenty per cent. above present tariffs, and is necessary to meet increased costs of operation. It is the intention to arrange for salary increases to employees to the extent of ten per cent. above present rates of pay.

MANAGERS APPOINTED: D. R. Sandford, Waynesboro, Ga.; C. H. Mill, Troy, Ohio; W. J. Fisher, East Palestine, Ohio; A. P. Dodson, Montezuma, Ga.; J. H. Ward, Dade City, Fla.; M. M. Jenkins, Cheraw, S. C.; J. P. Seffins, Alliance, Ohio; F. G. Lyon, Fort Smith, Ark.; W. C. Achgill, Oklahoma City, Okla.; C. M. Kunz, Topeka, Kan.; M. C. Disy, North Adams, Mass.; A. M. Howard, Saratoga, N. Y.; L. J. Vesey, Goshen, Ind.; E. E. McCubbin, Great Bend, Kan.; J. C. Winnickie, Atchison, Kan.; S. R. Albright, Norfolk, Va.; W. B. Drury, Suffolk, Va.; R. D. Lawrence, Fort Valley, Ga.; W. A. Orman, Columbia, Tenn.; W. L. Pierce, Cleveland, Tenn., and Mrs. Hattie Furr, Fulton, Ala.; A. T. Nelson, Marinette, Wis.; L. F. Smith, Pine Bluff, Ark.; C. I. Hood, Shreveport, La.; A. M. Livingston, Montgomery, Ala.; J. F. Jackson, Tuscaloosa, Ala.; W. J. Sadler, Goldsboro, N. C.; A. L. Eade, Crawfordsville, Ind.; F. W. Schupp, Barberton, Ohio; E. M. McFarland, Muskegon, Mich.; A. J. Mendina, Denison, Tex.; W. E. Judd, Ashland, Ky.; F. L. Brown, Cleveland, Tenn.; Francis Corcoran, Potsdam, N. Y., and Mildred Carroll, La Salle, Ill.

EFFECTIVE November 7, the offices at Wilkes-Barre, Scranton, Pittston and Hazleton, Pa., were transferred to the district under Superintendent C. E. Bagley, Philadelphia, Pa.

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New York Postal Items

A. AUSLANDER, heretofore in the Cotton Exchange office, has been transferred to the main operating department and assigned to duty in the Overland quadruplex department.

D. G. ROGERS and JAMES RUSSO have been assigned as assistants in the Southern quad department.

W. E. TODD has been appointed office electrician, main operating department, vice A. J. Ward, transferred to the traffic manager's department.

A. P. KRANSHAAR, formerly in the quad department, is now in charge of traffic to Pittsburgh and southwestern points.

Albany, N. Y., Postal

MISS A. ROBERTS, for several years at Rutland, Vt., has been transferred to Glens Falls, N. Y., as manager, succeeding D. F. Murphy, transferred to Hudson, N. Y.

W. H. GOLDSTEIN has been appointed operator at Rutland, Vt.

FRANK HAYWARD has returned to duty at Albany, after relieving Manager Benjamin at Amsterdam, N. Y.

MISS MOCHRIE, cashier at Albany, is spending her vacation in New York and Atlantic City.

Washington, D. C., Postal

C. F. THOMPSON, general wire chief, was taken suddenly ill on October 7, and still is in the hospital in a serious condition.

J. E. HILL, for many years operator in the Washington office, died at his home here on October 10.

Chicago Postal Items

C. A. Comstock, assistant to the general manager, is at present in Chicago on general inspection.

JOHN F. LOONEY, superintendent, Indianapolis, Ind., was a recent visitor at Chicago headquarters.

F. F. NORTON, of the New York main office, is in Chicago for a few days in the interest of the service.

L. R. THOMAS, superintendent, has returned from a trip of inspection to offices in his district.

R. D. PALMER is now permanently in charge of the office at Galva, Ill.

MISS M. L. CARROLL, of Peoria, Ill., has been appointed manager at La Salle, Ill.

S. S. BURKETT, formerly with the Associated Press, Chicago, is now manager of this company's office at Springfield, Ill.

MRS. A. L. JOHNSON, manager at Niles, Mich., was a recent business visitor at headquarters, Chicago.

G. G. VETTER, district manager, Grand Rapids, Mich., was a recent visitor in Chicago. The trip was a combination business and wedding journey. Mr. and Mrs. Vetter received congratulations from many friends in the first district.

R. F. LAMBERT has returned to Hillsdale, Mich., as manager.

MRS. J. DELONG, manager at Hammond, Ind., has returned to duty after a three weeks' vacation.

MISS ALMA BARNES, manager at Hastings, Neb., has returned from her vacation.

MRS. C. V. HUTCHINS, manager at Grinnell, Iowa, has returned from a month's vacation.

ARGYLE GUDENSWAGER, of the Des Moines-Chicago circuit, spent his vacation at Minneapolis, Minn., and Mason City, Ia.

THE MARRIAGE OCCURRED RECENTLY of Mrs. C. L. Parmley, formerly cashier, and Fred S. Johnston, foreman in charge of line rebuilding.

IN A Y. M. C. A. BICYCLE RACE recently held between Newton and Des Moines, Iowa, two Postal messenger boys—Edward Riese and Charles Trotter, helped the Des Moines boys to win. Riese made a mile in one minute and forty-eight seconds—the fastest mile made in the entire race.

San Francisco Postal

DON H. TOWNSEND, chief operator, main operating room, spent his vacation in Los Angeles and vicinity.

B. W. FIELDS, division engineer, Pacific Division, has completed the installation of additional repeater equipment in the Butte, Mont., office.

L. J. MILLER has been appointed manager of the San Francisco main office, vice George W. Holt, transferred to the general superintendent's office. Mr. Miller has been manager of various important branch offices in San Francisco during the past five years. He also served one year as traffic chief in the main operating room.

MRS. D. H. FLOYD has been appointed cashier of the main office, vice Mrs. A. E. Shields.

MISS E. F. MEADER, heretofore chief operator's stenographer, has been transferred to the manager's department.

H. W. PUNCHES, assistant to the division engineer, is engaged installing additional equipment in the main operating room, including additional telephone equipment.

F. E. SCHMEDIEKE, night traffic chief, has returned from his vacation. H. H. LING, late night chief operator, is now away for a rest.

W. S. VAWTER has been appointed division cashier, vice Miss M. Cassasa.

THE MORSE SCHOOL, under the direction of C. A. Balsley, quad chief, is operating successfully. Fifteen students are now in regular attendance. Miss B. Brugler, a recent graduate, is now working a wire in the main operating room.

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THE POSTAL ELECTION BULLETIN SERVICE proved a great success throughout the Pacific States. Reports from many offices show that the Postal was first in reporting most of the important election results.

H. W. HETZEL, traveling auditor, is visiting offices in the Pacific Division.

S. G. KITCHEN has been appointed manager of the office at Sacramento, Cal., vice J. K. Beede. Mr. Kitchen has been manager at Stockton, Cal., where he made an excellent reputation as a business getter.

MRS. P. A. ALLEN, wife of P. A. Allen, operator in San Francisco for the Commercial Pacific Cable Company, has recovered sufficiently from injuries received in a recent train accident to permit of her removal from the hospital to her home.

John C. Purches

John C. Purches, who on October 11, was appointed manager of the Postal Telegraph-Cable Company's office at Erie, Pa., has been a resident of that city for several years. For some time he was employed in the railroad telegraph service, and during the past year has been manager of the telegraph department of the Erie Forge Company. Mr. Purches is a prominent member of a number of fraternal organizations and is well and favorably known to the business interests of Erie.

Charles A. Johnson

Charles A. Johnson, manager of the Meadville, Pa., office of the Postal Telegraph-Cable Company, on October 22 last, celebrated his fifty-fourth birthday. Mr. Johnson has been identified with the Postal company continuously during the past thirty-seven years. At seventeen years of age he engaged in the service as lineman at Greenville, Pa., and immediately taking up the study of telegraph operation, he soon qualified as a telegrapher. Continuing his studies, Mr. Johnson became proficient in the handling of switchboards and telegraph apparatus. When Meadville, Pa., was made the main repeater station on the northern route between New York and Chicago Mr. Johnson was placed in charge of the office.

He has to his credit a number of telegraph inventions which have been used in service, the most generally known of these being the "three coil" spark killer, employed in multiplex sets to reduce sparking at transmitter contact points.

Telegraph and Telephone Life Insurance Assn.

The adjourned annual meeting of the Telegraph and Telephone Life Insurance Association was held at 195 Broadway, New York, on November 8, when the new constitution and by-laws were unanimously adopted. With the adoption of the new constitution, the executive committee feel that the membership at large will be well satisfied with the change and that the life of the association will be extended indefinitely.

"The Night Operator"

"Telegraphers who enjoyed reading "The Wire Devils" will welcome this new book by Frank L. Packard. The book contains a number of short stories written about the alluring game of railroading; the first story, "The Night Operator," is also the title of the book.

In "The Night Operator" you will follow with spell-bound interest a panorama of rushing mountain rivers and dangerous curves, of brave men responsible for the safety of others, who meet their obligation with high hearts and abounding courage.

And when the book is read you will recall with delight "Toodles," the spunky little night operator; "Royal Carlton," the big superintendent"; "Regan," the purposeful master mechanic, and "Timmy O'Toole," the valorous Irishman, and say to yourself, "Packard has done it again; written another breathless adventure story; I hope he goes on writing them."

The price of the book is $1.75 net. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The Tone Regulator

The wire chief was showing his lady friend the wonders of a modern telegraph office. In the generator room the wonders of the switchboard were being described in detail, when a field-rheostat with a highly polished radial arm caught the young woman's eye. "Oh, George!" she said. "Is that what you make the messages soft or loud with?"

THE IMPERIAL CABLE CIRCUIT, from London to Halifax (formerly a German transatlantic cable), is operated by means of syphon recorder receiving apparatus, and at the London end by Creed printing telegraph apparatus. The section of cable extending between Penzance, England, and Fayal is 1,354.6 nautical miles in length and the Fayal-Halifax section 2,108 miles in length.

Radio Buzzer Sets

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $3.50 for the set.

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OBITUARY.

Death of George W. Stevens

George W. Stevens, sixty-nine years of age, president of the Chesapeake and Ohio Railroad Company, died suddenly at White Sulphur Springs, Va., on November 4.

Mr. Stevens began his business career at thirteen years of age, when he secured employment as a telegraph messenger with the Baltimore and Ohio Railroad. He soon became a telegrapher, and in the years following advanced through the various service grades—agent, dispatcher, superintendent and general superintendent, on railroads operating throughout the central, western and southern states. He had been with the Chesapeake and Ohio Company since 1890, and during the past twenty years had served as president.

ROBERT L. FULTON, aged 73 years, died at his home in Oakland, Cal., on October 24. In his youth Mr. Fulton worked as telegrapher on the Erie Railroad. During the construction of the Union Pacific Railroad he was employed as operator at various points along that line. In later years he became a prominent politician in the State of Nevada and was one of the founders of the Reno, Nev., *Gazette*.

JOHN HONS, aged forty-six years, auditor of the Bell Telephone Company of Pennsylvania, died at Philadelphia on November 2. Before going to Philadelphia, Mr. Hons was identified with telegraph interests in Brooklyn, N. Y., for many years.

JOSEPH L. EDWARDS, aged eighty-two years, the last surviving member of the original House Printing Telegraph operators, died at Collingswood, N. J., on October 31. He was born at Philadelphia, and had been identified with the telegraph from 1854 until 1906, retiring from active service on the abandonment by the Western Union Telegraph Company of the Phelps Printing Telegraph System. Mr. Edwards was manager of the New York City and Suburban Printing Telegraph Company in New York in 1855. He also held important positions at Boston, Troy and Springfield, returning to New York in the early sixties, where he remained in Western Union service until his retirement.

CHRISTOPHER A. SHEA, aged fifty years, of Boston, Mass., a well-known expert telegrapher and an inventor of electrical apparatus, was instantly killed by a motor truck at the corner of Wall Street and Broadway, New York, on November 9. The remains were taken to Milton, Mass., by his brother, for interment.

CHARLES C. BEDLOW, seventy-one years of age, for many years connected with the Western Union Telegraph Company, died at Webster, N. Y., on October 29. In the year 1884 Mr. Bedlow was assistant superintendent at Bangor, Me., and in 1890 was transferred to Boston. Since 1893 he had been superintendent of telegraph of the Boston and Maine Railroad, retiring early in the year 1918.

WALTON O. SNYDER, an old-time telegrapher, who had been in the brokerage business for over thirty years, and who recently died at his home at Bridgeport, Conn., was well known to the fraternity in New York, Philadelphia, and elsewhere. He was born in Elliottsburgh, Pa., January 19, 1863, and he held important local positions with the Western Union Telegraph Company, the American Union Telegraph Company, Spellier Electric Time Company, and the Baltimore and Ohio Telegraph Company in Philadelphia and New York until 1889, when he identified himself with the brokerage business, with which he had remained at various places until the time of his death. He is survived by his wife and a son.

ALLAN W. AUSTIN, for forty-one years an employee of the Western Union Telegraph Company and during the past fifteen years manager of the company's branch in the office of the Boston *Post*, died on November 3, at his home in Medford, Mass. Mr. Austin was widely known as an expert press telegrapher.

H. E. WEST, aged sixty-two years, identified with one of the United States Government cable steamers as an electrician, died at his home in Bayonne, N. J., on October 19.

JAMES A. COX, a telegrapher with the Western Union Telegraph Company at St. Louis, died at that place on October 25. He was fifty-nine years of age.

GEORGE W. MURRAY, thirty-five years of age, night wire chief for the Postal Telegraph-Cable Company at Washington, D. C., died suddenly in that city on November 5. His death was due to acute indigestion and heart trouble. He is survived by his widow, two sons and a daughter. Interment was at Hagerstown, Md. Mr. Murray was a thoroughly capable telegraph man and was popular with his associates in the service.

ABBIE TURNER, aged seventy-three, one of the veteran women telegraphers of New England, died at Boston, November 6. Miss Turner was manager of the Western Union at Lynn, Mass., for some time previous to July 19, 1883. A week after that date she became identified with the American Rapid Telegraph Company at Boston. She remained with that company and its successors, including the Postal Telegraph-Cable Company, until about three years ago, when she returned to Western Union service.

Telegraph and Telephone Life Insurance Association

Assessments 685 and 686, dated November 1, have been levied by the Telegraph and Telephone Life Insurance Association to cover the claims arising from the deaths of Wallace C. Cox, John M. Fogle, Warren J. Cole, John C. Watts and Joseph G. Harter.

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Telegraph and Telephone Age

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No. 24 NEW YORK, DECEMBER 16, 1920 Thirty-eighth Year

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SUBMARINE CABLE SITUATION

Technical recommendations of the delegates of the five allied and associated powers to be submitted to the general conference of all nations for approval, as made public on December 8 through the State Department at Washington, show that disposition of the former German cables seized by France, Great Britain and Japan in 1914, still remain unsolved. This was one of the principal questions for settlement with which the conference was charged.

Desirability of more cables between North America and the Orient and between America and Australia and a cable connecting North America and Italy as well as a proposal for the amalgamation of the telegraph and radio conventions formerly governing international communications were among some of the important recommendations made by the conference. It also was proposed that a universal electrical communications union be established, having for its object the international reciprocal exchange of telegraphic and telephonic communications by land line, cable, radio and all other forms of signaling, as well as the extension and improvement of such means of communication.

It was proposed that an electrical communications council should be established, consisting of representatives of Great Britain, France, Italy, Japan and the United States and four representatives selected by the other powers who will compose the personnel of the general communications conference to be held after the adjournment of the present preliminary conference. Such a council would meet frequently and have general advisory and consultative powers and its functions would be to encourage the improvement of communication facilities and the exchange of traffic.

So far as formulation of a code of international law relating to communications was concerned, it was decided to propose an agreement among the powers not to grant hereafter exclusive cable landing or radio rights serving to check the development of communications facilities. Formulation of an international code determining the status of submarine cables in war time also was proposed, such a code to be prepared at a special conference to be held at The Hague or in connection with the forthcoming world communications congress.

The British draft of the amalgamation of the radio and telegraphic conventions served as a basis for discussion, but in the draft finally agreed upon each delegation reserved the right to submit modifications or additions at the world congress. This action is understood to have been taken as a result of the recommendation of the American delegates and was based on the fact that in almost every country, except the United States, the telegraph systems are government owned, and in many countries radio communication is a government monopoly.

The proposed convention specifically recognizes that in certain countries communication facilities are in whole or in part provided by private enterprise, and these private enterprises are authorized to exchange international traffic with all government owned communications services.

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Cable authorities see in the recent announcement by the British government of its purchase from the shareholders of the stock of the Direct United States Cable Company an attempt by that government to break up American control of most of the transatlantic cables, which, it is claimed, has existed for the past eight years.

It is pointed out that, although nearly every cable under the Atlantic Ocean was made in Great Britain and laid by British ships and British workers, United States interests, in the past few years, have acquired control of the majority of these lines, excepting, of course, the German cables taken over by the allies during the war and the French lines from Brest to St. Pierre and New York.

As showing the predominance of the United States in the control of Atlantic cable lines, it is pointed out that the two main systems are those of the Commercial Cable Company, an American concern headed by Clarence H. Mackay of New York, and the Western Union system, which operates not only the Western Union cables, but leased the Anglo-American and Direct United States cable line in 1912. This arrangement, it is said, has resulted in the control by America of the two most important transatlantic cable systems. It is understood, also, that the French cables have a friendly relation with the Western Union system.

One of the two German cables across the Atlantic seized by the allies during the war was diverted so that its terminals were at Penzance, England, and Halifax, N S. The European end of the other German line was diverted from Emden to Brest, France.

This left only one German cable under British control, and there was no guarantee that this arrangement would be allowed to continue in the future.

The Direct United States Cable, control of which has been purchased by the British government, extends from Ballinskelligs to Harbor Grace, N. F., and thence to Halifax, N. S. The understanding is that this line will be taken over by the British government and worked in connection with the former German cable to Halifax, thus giving the British Imperial Service two cables instead of one. This second line was acquired by the British government as a safeguard in case of any damage to the one-time German cable. At Halifax both these Imperial cables connect with the Canadian Pacific Railway lines across Canada. Cablegrams transmitted from London are carried by this route across the Atlantic and Canada and thence by Pacific cable, which is also a part of the Imperial system, to Australia, New Zealand and other points in the Far East.

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The Ocean Cable Muddle

A somewhat bewildering assortment of news has been served up during the last few days in regard to the cable situation as affected by the deliberations of the International Communications Conference now in session in Washington. At the risk of some repetition, the following data are presented in order to make the subject intelligible to the ordinary reader: The Peace Treaty provided for a conference of the allied powers and the United States to be held at Washington to determine how the submarine cables taken from the Germans should be finally allocated. Incidentally, the conference was to consider the question of international communications generally.

Reports from Washington indicate that the conference is deadlocked on the major proposition of the allocation of the German cables. Great Britain seized one and is apparently going to keep it; France seized several and is holding on to them all with remarkable tenacity; Japan took charge of those in the Pacific and has declared her intention of retaining them, as likewise that very important landing station, the island of Yap. American companies were vitally interested in the German Atlantic cables and in the German-Dutch cables in the Pacific, but the United States is apparently to get nothing in the pending distribution. On the other hand, a cable and radio convention is in process of being evolved which will be imposed on American cable and telegraph companies, who will thus be compelled to assist foreign competition to their own undoing. According to a report published on December 4, the United States delegates were not interested so much in settling the ownership of the cables as they were in wiping out all restrictions on international communications such as cable monopolies bring about. From this it would appear that the official representatives of the United States are content to present any foreigner with facilities for cutting and appropriating cables carrying American correspondence, their only concern being the extent to which they are able to assist foreigners in imposing restrictions on American business and reducing American telegraph enterprise to the humdrum level of European inefficiency.

Great Britain's private cable enterprises disappeared from the Atlantic several years ago, and all the British cables in the Atlantic were leased to an American company. The fortunes of war gave the British government the opportunity of appropriating a German Atlantic cable, which they refuse to give up. This one ran from the United States to Germany by way of the Azores, and did not touch British territory at all. It was cut to prevent communication between the United States and Germany while the United States was still neutral, and it was connected with England and Canada, between which it rests today. Recently the British government has acquired or is about to acquire another cable which was one of those leased to an American company, but which that company declined to retain and threw back to its British owners, who are in process of selling it to the British government. Being in the way of becoming owner and operator of Atlantic cables, the British government desires the use of the American land lines on its own terms. Hence the cable and radio convention by which the American delegates appear desirous to bind the American cable and telegraph companies, apparently forgetting that the land line systems of the United States are private enterprises developed by American private capital.

It is being made to appear that this proposed confiscation of American telegraph rights is to inure to the benefit of American radio corporations. The radio stations in Great Britain and France which correspond with the American radio stations are not American—they are British and French. It seems to be the present policy of Great Britain, having lost her pre-eminence in Atlantic cables and being in no position to lay new ones, to have a great chain of British wireless stations encircle the world. The American telegraph companies have publicly declared their willingness to make reasonable arrangements for collecting and transmitting messages for competing concerns. This, they claim, they have always done, and as proof of the assertion they evidence arrangements made for the German Atlantic radio operating from Sayville, Long Island, from the time of its installation until the entrance of the United States in the war.

The French Cable Company is a government owned or government subsidized company. It appears that messages are collected for that company here by special arrangement. The point has been made that the British Telegraph Company will convey a message over the English land wire to London, but that the American Telegraph Company will not receive a message if it is routed by wireless. The answer to that seems to be that the British Telegraph Company is the British government, which rolls up year after year huge deficits on its telegraph business, to be made good annually by the taxpayers.

American cable companies are heavy taxpayers in Great Britain and France, and it is urged that the cases are not parallel. Briefly, the position of the American telegraph companies is that they have no desire to hinder wireless development, but they have a natural objection to conceding the use of their facilities to competing enterprises without adequate compensation.—*Journal of Commerce.*

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Morale

On the whispering circuit behind the scenes in most large organizations one frequently hears it stated that the morale of the employees has been "shot to pieces." In some cases the report reflects the existing conditions, but more often it reflects the views of an individual only. Even in those instances where low morale exists as a result of temporary lack of ability and vision at the top the man with an eye to the future realizes that opportunity is at hand. Steadfastness, and a desire for the prosperity of the undertaking with which one is identified constitutes morale.

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THE ROTARY REPEATER

By O. E. Pierson, in the *Telegraph World.*

For the benefit of those who have not had the opportunity to familiarize themselves with the why and wherefore of the new Rotary Repeater, we will endeavor to briefly set forth the fundamental theory governing its operation.

In automatic telegraph circuits it is of utmost importance that the signals arrive at the receiving end in equally spaced intervals of time. If, because of some distorting factor, a signal is slightly delayed, it will be apt to fail to reach its proper destination, since we are depending on a brush which rotates at a constant speed to distribute the signals to their respective receiving devices. Now, it is well known that such distortions occur and that if the circuit is of considerable length and includes several repeaters a great deal of difficulty may be experienced in making the circuit work properly. The old style repeater simply magnifies the signals, but does not improve them in the least. The distortions, as well as the good portions, are magnified and the signal is passed on the same as received, if not a little more distorted. Because of this fact the speed of such a circuit will be an inverse function of its length, regardless of how many repeaters are used.

The purpose of the rotary repeater is to overcome this difficulty. It not only strengthens the signal, but it removes all distortions, both in shape and in moment of arrival, and sends the signal out practically as good as when originally sent from the terminal.

In the ordinary type of repeater the main line relay constantly controls the transmitting relay so that if the signal arrives early it is sent early. If it arrives late it is sent late, and, in fact, any distortion in the received impulse will faithfully be repeated into the next line. Thus we see that a bias, either due to improper centering of some relay or to an unbalance passes without any difficulty through the repeater and can be detected by the next repeater or terminal.

In the rotary repeater the repeating relay is connected to the main line relay only at short intervals by means of a pair of brushes passing over the segments of a receiving ring. By exactly the same method as is used at a terminal the brushes are kept in synchronism with the incoming signals and by connecting only the selecting segments of the receiving ring to the main line relay we make use of the peak of each signal only. The action is similar to the method used at the terminal for making use of the peak of the wave. By placing our receiving ring in the proper position we connect the main line relay to the repeating relay only at the moment when the signal is at its peak or most reliable part. During the rest of the time the repeating relay is held on one side or the other by a local locking device. It is evident that under these conditions the length of our repeated signals depends only on the time it takes the receiving brush to travel from one selecting segment to the other. The signal will arrive while the brush is on the segment between the selecting segments, and the exact moment of its arrival can vary by the length of time the brush takes to cross this segment. But the moment of transmission cannot vary. Regardless of whether the signal arrives late or early it will not operate the repeating relay until the brush gets to the selecting segment. When the brush reaches this segment current will flow from the tongue of the main line relay, which will by this time be firmly against its contact, across the brush and segments to the repeating relay, causing its armature to move to the marking or spacing side as desired. The tongue of the repeating relay having been moved to its proper contact cannot again be influenced by the main line relay until the receiving brush reaches the next selecting segment, when a reversal can take place if wanted. The segments which separate the selecting segments are known as locking segments. Their function at the rotary repeater is to lock the repeating relay on which ever side it was placed by the impulse from the main line relay. They receive battery from the tongue of a polar relay known as the locking relay, connected in series with the repeating relay and having battery connected to its contacts so that it will always place the same battery on the locking segments as was first placed on the selecting segments by the tongue of the main line relay. The main line relay employs the Gulstad or vibrating principle and has its contacts connected to the positive and negative poles of the line battery generators, as has also the locking relay.

It can readily be seen from this that the only function of the main line relay is to determine if the repeated signal is to be marking or spacing, and that the duration of the impulse and the moment transmission begins is determined locally by the distributor. If the signals being received by the rotary repeater are not so badly distorted but that they could be printed on a terminal set in place of the rotary, they will be sent out perfect. Thus rotary repeaters inserted in a circuit will make the speed of the circuit a function of its poorest section, i. e., from rotary to terminal or from rotary to rotary if there are more than one, instead of a function of its entire length, as would otherwise be the case.

Aside from the synchronizing apparatus and the distributor the equipment of a rotary repeater is not essentially different from that of a universal repeater set. Provisions for Morse transmission and reception at the repeater are practically the same, local arrangements for observing the transmitted signals, balancing, etc., are identical. Although the repeater is designed to pass only signals which are in synchronism with the rotating brushes, no trouble is experienced in passing Morse signals if they are sent at a moderate rate of speed so that when a dot is made the receiving brush will have time to reach at least one selecting segment.

There is also an arrangement provided to facilitate matching of speed. In consists of a bank of five lamps of the switchboard type connected by a strap key via the segments of the sending ring to

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one side of the corrector relay so that when the distant end sends his correcting impulse it will fall in turn on each segment of the sending ring, causing the corresponding lamp to flash. By having each fifth segment of the sending ring multipled together only five lamps are required. The action is similar to that at the terminal and enables the attendant to quickly match the speed of the distant distributor.

In conclusion we might add that the rotary repeater is beyond the experimental stage and that on all circuits where it has been installed it has proved a great success. It can be classed as one of the great inventions of modern times, and due credit should be given the men who first demonstrated its practicability.

Western Union, Dallas, Office

By D. E. Van Orden

The Western Union Telegraph Company has just completed its new quarters at Dallas, Texas, which will provide a more attractive office, together with added facilities and highly efficient telegraph service in that section.

The building, which was formerly occupied as the Masonic Temple, lent itself admirably to the necessary alterations required to convert it into a modern telegraph office, and it may be truly said that Dallas represents an "up to the minute" arrangement for telegraph service.

The building houses the operating department and all of the departmental division offices. The ground floor is devoted to the commercial office, including a tailor shop for the care of messengers' uniforms and a messengers' clubroom. The equipment on that floor is all new and up to date. The public commercial office offers an attractive space in which the public may transact its telegraph business. The basement provides storage space for the various departments together with a modern cafeteria, where the employees may enjoy a social half-hour at their meals, which are in keeping with those served in any first-class restaurant, and which are provided at a nominal charge.

The second floor accommodates the auditor's office and multiplex schools. The third floor is taken up by the division plant superintendent's forces, the traffic routine school and the employment bureau. The fourth floor takes care of the women's and men's locker rooms and the testing and regulating department. Seven repeater tables, four sections of loop board and a time service section make up the equipment installed in the testing and regulating department. The office wires and outside cables terminate on a forty-section distributing frame. The motor generators and their auxiliary equipment are located back of the distributing frame. The wire chief, observers and dispatchers have their desks located in the testing and regulating department.

The division commercial and traffic offices, together with the telephone department, are located in the fifth floor. The telephone department has been equipped with two sections of P. B. X. boards, ten sections of receiving positions and ten sections of delivery positions.

The operating room, which is modern in every particular, is located on the sixth floor. No effort has been spared to make that room second to none in the service for the efficient handling of the large volume of business which passes through this department. Pick-up and delivery belt conveyors carry the messages between the operating positions and the routing center, which is located on the mezzanine floor, and add greatly to the speed with which telegrams may be transmitted.

Power and light are obtained from the local commercial supply, and emergency power equipment has been provided to furnish power for telegraph service in case of failure of the commercial supply. Two units have been installed, each consisting of a 65 H. P. Buffalo marine type engine ,direct connected to a 50 K. V. A. Ideal alternator assembled on a cast iron sub-base. The engines are designed to start on gasoline and operate on kerosene, and are equipped with electric starters. The alternators will deliver 220 volt, 60 cycle single or three phase currnet, and are equipped with direct connected direct current generators for exciting the alternator fields.

Switching facilities have been provided for dividing the telegraph and other loads to be imposed on these units. The arrangement is quite flexible and permits various groupings of loads on one or both units, thus making it possible, if one unit is out of service, to operate from either unit such equipment as is most essential at that time.

Transformers have been provided for stepping down the emergency alternator voltage to that required by the lighting system in the building.

The alterations to the building and installation of the equipment were all under the direct supervision of Division Plant Superintendent Hilbert and Division Equipment Supervisor Schunder, assisted by the various interested departments. The initial studies for the conversion of the building were started in the latter part of 1918, plans prepared and the office cut into service November 28, 1920.

Canadian Association to Sell More Electricity

The Electrical Co-operative Association of the Province of Quebec has been formed to promote the growth of the electrical industry in all its branches. One of the duties of the field representatives under a secretary-manager will be in the sphere of newspaper advertising in expanding the business and in building up good-will for the electrical dealers and contractors.

The electrical business transacted in Quebec in appliances amounted to over $18,000,000 last year. The new association has an objective of $100,000,000.

In Response to a questionaire sent out by the manager of a telegraph office recently, to the parents of his messengers, the following reply was received on one query: Q. Would you recommend to your friend that his son be allowed to work as Messenger? A. No. Q. If not, why? A. He ain't got no big son.

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Work of British Cable Engineers

By J. Bourdeaux, O.B.E.

"Now that the Armistice has been signed, the cable ships, which have had to remain in harbor owing to the submarine warfare, are now going out to effect the repairs to the cables which have become faulty during the past five years." A paragraph to this effect appeared in many papers about Armistice date, and it shows how little was known ashore of our activities in connection with submarine cables during the war period. It also shows how effective was the secrecy which covered all our operations. Now that the veil has lifted, however, I can perhaps, in the following short memoir, say a few words to enable a probable false impression to be removed from the minds of our colleagues in the service ashore. I cannot, however, in this article attempt even an outline history of what was done—such would provide matter for a huge volume.

The heraldic crest which forms the badge of the Post Office submarine cable branch is associated with the motto, "Ne Tentes aut Perfice," a motto which claimed and obtained faithful adherence during the whole of the time our nation was at grips with the enemy, especially during the period when the nation was subjected to the blind and terrible submarine warfare on the mercantile fleets of the whole world, both belligerent and neutral.

I have a vivid recollection of the outbreak of the war, when with our little ship *Alert* we were sent out in accordance with orders on a cable-cutting expedition, a job which was quietly and quickly accomplished at the dead of night, the little ship returning to her base next morning—a preliminary war operation widely attributed to one of H. M.'s ships of war.

At that date we had two cable ships, the "little" one, *Alert,* referred to above, forty-three years old, with but a small radius of operation, mainly restricted to cable work in and about the English Channel. This vessel had, however, I believe, a larger number of cable repairs to her credit than any other ship afloat. The other ship, *Monarch,* was a much larger ship, thirty-one years old, and was fit and able to do any work in the waters around the United Kingdom. This vessel had the distinction of being actually the first ship designed and laid down for the special purpose of cable work. She also sailed on the night of August 4th, 1914, for the north, where many emergency cables were laid and repaired until she was relieved by another ship specially equipped. Shortly afterward, however, she met a "glorious end," and in the English Channel, the scene of much of her work, "her shattered bones" now lie on the bed of the sea, entombing the three of her crew which were the only lives lost out of her entire complement. During the early part of the war we went about on repair work alone and unattended, but when the intense submarine war developed, naval escorts were provided by the Admiralty. Escorts, however, are not a safeguard against submerged mines, so on a fine morning in September the old *Monarch* met one and went down with her flag flying. It was indeed fortunate that the weather was fine and the escort close at hand, otherwise there would undoubtedly have been a greater loss of life, as the ship disappeared about three minutes after the explosion.

On another occasion, one very quiet night about 9.30, when the *Alert* was at anchor close inshore, a peculiar humming was heard, which increased in volume very rapidly, and then gradually died away. The writer thought at the moment that it might have been a bomb from an aeroplane, but as there was no noise of air-craft the assumption is that it must have been a torpedo, which, probably owing to *Alert's* light draft, had either passed under or missed.

Although constant vigilance was maintained, a cable ship when effecting a repair, and deprived of manoeuvering powers by attachment to the cable, was peculiarly vulnerable to torpedo attack; nevertheless, we all got used to the novel conditions, and were able to keep this country and the continent in constant electrical communication, by repairing the cables as they became damaged and supplementing them by many new ones. Although ships were forbidden to work in certain areas which were regarded as too dangerous, it was frequently necessary to approach those areas very closely in the course of the work. On one occasion the writer was told by a naval authority, "Yes, you can make this repair, but if you go beyond this point it will be at your own risk." "Our own risk" was reached before the repair was completed, but fortunately the work was done in a few hours and the ship returned without accident. On another occasion, when the ship was fast to cables, it was reported that drifting mines had been sighted and were coming along close to the ship, which had then to be manoeuvered to clear them at the risk of breaking away from the cables. On yet another occasion a ship working "at her own risk" hove up a mine with the cable. The mine exploded, but beyond shaking things up, damage to machinery, breakage of glass and crockery, nothing more serious occurred.

Not only were submarines a menace, but air-raids were, in a somewhat lesser degree, disturbing. Despite all this, France, Belgium, Holland and Norway were all kept in communication, and the cables to Ireland and the outlying islands all round the Kingdom were regularly repaired all through the war.

During the greater part of the war we had a fleet of four cable ships, three trawlers and a drifter, the latter vessels being specially fitted out for cable work, and commanded and manned by officers and men from *Monarch* and *Alert.* The empty places in the parent ships were filled by drawing officers and men from the cable companies and by recruiting from the merchant marine and fishermen. Our

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staff was supplemented by a few officers from the engineer-in-chief's shore establishment: Messrs. Myles Hook, F. H. Horner, J. H. Bell and C. Leigh, who were given temporary commissions to aid the submarine branch to deal with an amount of work which had become far too great to be handled by the staff available at the outbreak of war.

At the risk of seeming invidious where there are so many worthy of praise, I think it is but just to mention that the foregoing officers, who were not brought up to a seafaring life, acquitted themselves with distinction under most unusual conditions. At one of the principal naval bases Mr. Myles Hook, with the assistance of Messrs. Horner and Bell, was in command in a very large and highly important area for a long period of the war, involving the provision and upkeep of a very extensive system of naval and military communication lines. Mr. C. Leigh performed very valuable service in the Atlantic and English Channel.

I feel that this short memoir should not close without reference also to the submarine work carried on by the superintending engineers all over the country and in Ireland on cables in inland waters. Many land-jointers also voluntarily went all through the war, serving in the ships at sea all round the Kingdom, far away from their families for months at a time.

In addition to the ships already mentioned, the department at one time or other chartered every available cable ship, including the largest in the world: one was brought even from Canada. During the war three cable ships were lost, two of which were British. The United Kingdom was indeed fortunate in having available such a fleet of cable ships, and so many "good men and true" to carry on a work of such stupendous importance to the country and the Allies.—*Post Office Electrical Engineer's Journal.*

Edison Deplores Union's "Shackling" of Worker

In drawing a comparison between labor conditions of today and fifty years ago, Thomas A. Edison, the inventor, expressed in an interview satisfaction that the eight-hour day had not been invented when he was a young man. He did not believe that under it he could have accomplished what he has.

"I am not against the eight-hour day," said Mr. Edison, "or any other thing that protects labor from exploitation at the hands of ruthless employers, but it makes me sad to see young Americans shackle their abilities by blindly conforming to rules which force the industrious man to keep in step with the shirker. If these rules are carried to their logical conclusion, it would seem that they are likely to establish a rigid system of vocational classes, which will make it difficult for a workingman to improve his condition and station in life by his own efforts.

"I have always felt that one of the principal reasons for American progress in the past has been that every man had a chance to become whatever he wanted to be. It used to be fashionable to be ambitious. The employee planned to become an employer; the unskilled man sought to become more skillful. A young man was not well thought of if he was not striving for a higher place in life. There appears to have been a change in recent years. The present disposition is seemingly to say, in effect: 'I am what I am and so I shall remain. I aspire to nothing better than my present job. I ask for nothing, except larger wages and shorter hours.'

"Of course, I realize that the leaders of union labor have their political problems, but there ought to be some labor leaders strong enough and wise enough to make trade unions a means of fitting their members for better jobs and greater responsibilities. I wonder if the time will ever come when the unions generally will teach their members how to be better workmen and train the ablest and most ambitious to become bosses and employers.

"Will the trade union grasp its opportunity to become a school of industrial and commercial training for its members—the poor man's college and a friendly rival of our technical institutes and schools of commerce. If that time ever does arrive trade unionism will be on one of the world's greatest forces in social progress, and I think there will be a much better understanding between capital and labor.

"I hope I may have enough birthdays to enable me to witness something of that kind. I feel like it now. Inasmuch as the Prohibitionists have buried Johnny Walker under the Eighteenth Amendment, and he has no further use for his trademark in this country, I'll borrow it and say that I am 'still going strong.'"

Determining Australian Longitudes by Radio

According to the *Scientific American,* wireless signals are to be used in marking out the boundary between South and West Australia, defined by Imperial Act as the 129th degree of longitude east of Greenwich. It is proposed to determine the initial point on the line by utilizing longitude signals from a high-power radio station located at some point between Greenwich Observatory, in England, and Sydney Observatory, in Australia, the signals to be received simultaneously at these points. This undertaking will be the first step in a comprehensive scheme involving the redetermination of the whole longitudinal system of Australia. A committee has been appointed to carry out the work in Australia, comprising the Government astronomers of New South Wales, Victoria, West Australia and South Australia, the Commonwealth surveyor-general and the director of the Royal Australian Navy Radio Service. It has been ascertained that, under favorable conditions, signals from Lyons can be successfully received in Australia as well as at Greenwich, and signals from other stations more symmetrically situated are also being tested. The co-operation of the United States, as well as the British Government, has been invited.

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Telegraph and Telephone Life Insurance Association

Assessments Nos. 687 and 688 have been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of James M. Nixon, Savannah, Ga.; Norman G. Waldron, Kansas City, Mo.; Henry E. West, Bayonne, N. J.; Joseph A. Kunce, St. Louis, Mo.; Jesse E. George, Newton Junction, N. H.; Joseph L. Edwards, Collingswood, N. J.; John H. Hons, Philadelphia, Pa., and Charles W. Douglass, Troy, Ohio.

The adjourned annual meeting of the Association which was mentioned briefly in a previous issue, was held on November 8, and the revised constitution and by-laws were adopted with only two dissenting votes.

This action puts the Association on an absolutely sound basis, and clears the way for the new Third Division to be started, with rates which will insure the building up of adequate reserves, so that members who transfer to the new division and all who join the Association in the future may rest assured that payment of their policies will not depend upon special assessments or upon dues received from new members.

Members of the existing First Division who are not over fifty-five years of age may transfer to the new Third Division without medical examination, provided there is no increase in the amount of insurance held, by paying in the Third Division the dues corresponding to their attained ages. If a member is under fifty-five it is for him to decide whether or not to make the transfer. Every effort will be made to keep the assessments in the First Division at a minimum, but it is only fair to say the prospects point to an increase in assessments rather than a reduction. The problem will be to so augment and conserve the reserve fund that the death benefits of all members of the First Division will be assured. In this connection it is of interest to note that on December 31, 1919, there were outstanding in the First Division 4,382 certificates carrying $4,012,500 of insurance and a reserve fund of about $300,000. Of the total certificates 1,503 were held by members over fifty-five, who carried $1,464,000 of insurance.

Whatever decision as to transfer may be reached in individual cases, all members may rest assured that their insurance will be furnished as cheaply as possible. The management of the Association is in the hands of co-workers who serve without pay, and the only expenses are those incident to keeping the necessary records and to paying fees for medical examinations. Nearly every penny paid in goes toward the payment of death claims, or, what is the same thing, the building up of reserves to meet future claims.

This Association has a splendid record of service. It has been in business since 1867, has never contested a claim, and has paid out $2,500,000 in benefits. With a new basis of rates there is every reason why its career of usefulness should be extended and the name of the Association given a permanent place in the records of enterprise of the members of the telegraph and telephone fraternity. To this end an appeal is urged for the support of all in the campaign for new members, knowing that insurance in the new division can be recommended with complete confidence.

Western Union Thrift Club at Milwaukee

A messenger's savings campaign was launched on October 11, 1920. It embraces a plan covering a period of ten months with weekly payments of two cents during the first week and increases two cents per week up to and including the fourth period of the tenth month. The total savings in forty weeks is $16.40.

The plan was carefully explained to each boy together with the advantage of saving, and forty accounts were opened.

Notwithstanding the small weekly payments that the club started with, many of the boys trebled them, and after the fourth deposit over $200.00 had been placed in the bank.

There is now over fifty members including some of the junior clerks who have formed the habit of saving, and some of them had never saved a dollar before in their lives.

The slogan of the club is "If you haven't got the habit, get it now."

JACK CAPLAN, a barber at Lake Geneva, Wis., apparently was not gathering in the coin of the realm fast enough from the practice of his profession, and resorted to practices not approved by the law to add to his exchequer. He was a personal friend of the manager of the Western Union Telegraph office at Lake Geneva and a privileged visitor at the office. In some way he came into possession of several blank Western Union money transfer drafts, filled them out in regular fashion for various amounts, totalling a considerable sum. So much prospective wealth caused him to try to satisfy his longings for things his meager earnings would not supply, and on October 31 he presented himself at a jewelry store in Milwaukee, selected several articles for purchase and offered in payment one of the money transfers in the amount of $275, payable to himself. It was accepted in a way by which Caplan secured the goods selected and some cash, aggregating about half the amount of the draft, with the understanding that the balance would be paid the following day. When he left the store, the jeweler, doubting his wisdom in accepting the draft, called the Lake Geneva office by telephone, inquired about the genuineness of the draft, learned it was a fraudulent one, and put the Milwaukee police on the trail of Caplan, who was arrested November 1, tried November 27, and sentenced to four years' time in the bastile in Waupun, Wis., to perform such labor there as may be assigned to him and to reflect on the futility of trying to acquire wealth in ways that are dark, and to join in Wallingford's meditation that: "It takes a smart man to be a crook, but what a fool a smart man is to become a crook."

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How United States Can Achieve Renewed Prosperity

Over at Geneva most of the nations of the world are sitting in solemn conference for a purpose, says Lewis L. Clarke, president of the American Exchange National Bank, New York. Throughout history whenever any crises seemed imminent men foregathered for a purpose. The saving points of human history have all hinged on definiteness of action.

Here in the United States, from a position of smug satisfaction and supercontent, we have been catapulted into a swamp of mental indecision and business disturbance. The hawser which we thought roped us tight to the dock of progress has snapped over night, and capital and labor alike are prone to admit that the winds of destruction are buffeting us about in an ocean of unknown hazards.

What has become of the vaunted American initiative? What of the heritage of that principle handed down by our forefathers which in substance says to all of us, "no matter how thick the gloom or how dark the days, there is within you the power to dispel and the power to achieve."

The distinctions, commercial, industrial and sociologic, that have caused the nations across the Seven Seas to sit in amazed admiration have been won by us by virtue of the possession of cardinal qualities that stand for a dauntless manhood. Noted for our industry and generosity, we in truth epitomize the "beacon light upon a hill."

NOT THE TIME FOR INDECISION

And now in the present circumstances are we to constitute ourselves as a deathwatch over what some foolish minds consider a dying world? Or are we to assume our rightful position, standing foursquare to the wind and displaying a confidence akin to that of our fathers, which shall carry a message from Equator to Pole that shall have for its purpose the definite assurance that the United States of America has faith to believe that most of the troubles which confront mankind are imaginary and that by dint of honest application and unremitting energy we shall all shake off the shackles of indecision and thus continue our progressive march?

Let us stop and consider just a moment. The sun still shines, we have just as much of resources as we had yesterday, we are richer because of the knowledge of our mistakes, we have unimpaired machinery of production, our banking organizations have met the tests and are sound, our transportation facilities on land and sea are of the best, we have eliminated distances in world communication, the nations of the earth understand the needs of each other as never before, mother earth has yielded the most bounteous of harvests, and, finally, so far as America is concerned the recent election resulted in a concentrated authority that need not fear obstruction in the performance of its avowed constructive policies.

So let us all change our glasses and recognize that this dear old world in which we live is not a bad place, that from its hidden treasures we are privileged as never before to garner those things that bring into our lives a condition tending to increase our spirituality and our material comfort.

LOOK ONLY ON BRIGHT SIDE

Let us all do a little smiling, a little patting of the other fellow on the back, and, above all, let us bear in mind that the thing that made of America the greatest country under the blue heavens, namely, honesty, industry, generosity and spirituality, are still our cardinal assets and should be employed by each of us in these times with renewed determination.

If your confidence needs buttressing just stop for a moment and consider that this old world in which we have found such happiness has throughout the past ages been visited by every catastrophe of which the human mind can conceive, and from each of these dark periods it has emerged always and eternally a progressive world.

Just vision for a moment the pages of history that record such visitations as flood, fire, pestilence, famine, religious strife, civil commotion, wars, the destruction of Nineveh, Babylon, Persia, Rome, etc., and in contra-distinction note that despite these things, 1920 records a material environment the like of which mankind has never before in the history of the world enjoyed.

Finally, I say, cheer up; let's look on the bright side rather than the dark side, and, above all, let us understand that there are no insurmountable obstacles standing in the path of our progress, that we are competent to solve the things that confront us, that they will be solved, and that humankind will be benefited by virtue of our assuming an optimism in which we are fully justified.

Single Line Repeater

The single line telegraph repeater manufactured by the Jester-Cooper Company, Houston, Tex., is being used successfully on several large railroad systems and in commercial telegraph service.

The management of this repeater is as simple as that of an ordinary single relay and sounder set, with which all telegraph operators are familiar. No local battery is required in its operation.

S. O. S!

WILL YOU ANSWER THIS CALL?

ADVANCEMENT and BETTER PAY are AWAITING those who take up the study of Electricity.
THE NEW YORK ELECTRICAL SCHOOL instructs you in the PRACTICAL and THEORETICAL elements of electricity. You acquire BY ACTUAL PRACTICE and EXPERIENCE the art of Electrical Drafting, the most efficient business methods of Electrical Contracting, together with the skill to install and operate all systems for producing, transmitting and using Electricity
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Present Telegraph Conditions in Russia

There is so little that now comes to us from Russia in the way of reliable news matter it is no wonder that what is taking place in that country should remain dark to readers of American periodicals. The situation is almost as if Russia were on a distant planet.

The editor of a post-office journal (*St. Martin's Le Grand*), published in London, England, recently came into possession of a copy of a Russian post-office publication, which, among other things, contains references to the telegraph organization and service. It appears that the department is ruled by an autocrat named Liubovitch, under whose direction various directors manage departments.

The publication referred to contains various reports and reproductions of circulars issued from time to time. In one of these circulars Liubovitch says that "in spite of the great shortage of telegraphers, in particular for Morse instruments, 1,388 telegraphers at the central office (Moscow) and 127 at branch offices are being employed on work away from their instruments—this out of a total of 1,532 Morse telegraphers, and 1,726 altogether.

"I order this wicked waste to be put an end to in the shortest space of time. . . .

"Report to me personally in three days how the revision is proceeding. Have it finished definitely in a week and present your report on the results attained. The responsibility rests solely on the director."

In a further circular about the same office:

"The traffic put through at the Moscow telegraph office and the zeal in serving the instruments are not as high as they should be. This is due, on the one hand, to the lack of energy in the former administration of the telegraphs, and, on the other hand, to slackness among the operators.

"Absence in mass from duty—in most cases without any serious reason; leaving duty to go for walks; loitering from corner to corner without any definite object—all that takes place, and prejudices the already insufficient *cadre* of qualified operators, the greater conscientious part of whom carry out their duties accurately and have to bear a greater burden through the chronic absence of the more disorganized part."

"This must not go on.

"The heart of the *Sviaz* must beat without faltering.

"To that end I am strengthening the *cadre* of operators from other places. I order the director to bring from branch offices the skilled telegraphers who are employed on other duties, and also bring into force in the shortest space of time a series of measures for improving the food in the dining room and maintaining order there, and I appoint a special commission to report to me personally all delays and obstacles, etc., etc."

Discipline is to be strengthened.

Lists of idlers and absentees are to be furnished to Liubovitch personally each week for the worst of them to be handed over to the Revolutionary War Tribunal.

Thieving of supplies from the dining room to be stopped, etc., etc.

A further circular, dated in May, deals with the robbing of parcels.

"Reports continue to come in of the robbing of parcels.

"In view of the declaration of a state of war, the guilty are subject to the Revolutionary Military Tribunal.

"I remind everybody that for blackguards who rob parcels entrusted to them, I shall, without exception, demand shooting.

"All heads of provincial directions, post-offices, etc., I order to report all cases of those caught stealing, and to arrest at once the thieves themselves and to hand them over to the Revolutionary Military Tribunal."

Verily, the comrades of the commune are having the time of their lives. Loafers, robbers and blackguards in other countries are sequestered in quiet retreats, but in Russia it would appear that many of these gentlemen have attached themselves to post as close as possible to dining rooms.

But they had better watch out! Liubovitch is on their trails.

———o———

Telegraph Rates Found Reasonable

Rates for the transmission by telegraph of the usual 10-word fast message were found not unreasonable, unjustly discriminatory or unduly prejudicial on December 2 by the Interstate Commerce Commission in dismissing complaints brought by Norman T. Whitaker, an attorney of Washington, D. C., against the Western Union Telegraph Company and the Postal Telegraph-Cable Company.

The Commission also declined to accede to a request made by Whitaker that a general investigation of the reasonableness of telegraph rates be instituted by the Commission.

The complainant not having made even a prima facie case, the Commission declined his final suggestion to institute inquiries under the broad authority as to the reasonableness and fairness of defendants' rates. The breadth of those powers suggests that they should not be used captiously or vexatiously, the Commission said. It would be profitless to discuss evidence produced by the complainant as it wholly fails to show that any of the rates of which he has made complaint are unjust, unreasonable, unjustly discriminatory, unduly prejudicial or otherwise in violation of law.

The reports of the Commission disclosed that after Mr. Whitaker had filed his complaints, he had written to the general counsel of the Western Union Telegraph Company asking whether he should "present to your department or to the American Telephone and Telegraph Company an invention of mine which I wish to sell."

"At the outset," said the Commission's report, "we have the contentions of the defendants that the proceedings initiated by the complainant before us are patently vexatious."

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A New Departure in Telegraph Motor Generator Plants

By A. P. ACHIMORE

A departure from usual practice has been made by the Western Union Telegraph Company in adopting motor generators designed for wall or panel mounting in connection with the operation of three metallic circuits between New York City and North Sydney, N. S.

Inasmuch as there may be a great number of similar circuits operated between other important points, and a large number of machines may be required at any one point, it is important that the type and design of machines chosen should occupy a minimum amount of space, as well as having the best of operating characteristics.

The design decided upon is that of a motor and a two polarity or double commutator direct current generator contained within one housing, and, therefore, requiring but two bearings. The bearing ends are so designed that by turning them through an angle of 90 or 180 degrees with reference to the frame proper, the machines may be mounted on panels, walls, angle iron uprights or overhead.

Mounting on angle iron uprights was adopted, and the first installations which were at New York, Boston, St. Johns, N. B,. and North Sydney, N. S., were made in this manner.

Three machines were mounted on each pair of uprights, one above the other, with sufficient vertical distance between them to allow mounting voltmeter panels and carbon disc field rheostats.

The primary power leads for operating the motor generators are contained in rigid conduit and connected to motor control or starting switches of the safety type.

The generator switches are contained in a metal cabinet secured to the angle iron uprights immediately above the three motor generators. The leads between the switches in this cabinet and the motor generator sets and the cabinet and the telegraph sets are contained in rigid conduit and brought out at the points concerned through condulets.

An installation of three machines provides for two terminal sets or one repeater set with one machine in reserve. It occupies about one-quarter the space of a bench installation.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Better Lighting of Telegraph Offices

By J. H. MAYER

As a general proposition normal daylight is, of course, preferable to artificial lighting for most working purposes in telegraph offices. In a great many cases, however, it has always been necessary to resort to artificial lighting for day as well as night work.

There are old timers, still in the harness, who can recall the advent of electric illumination in telegraph offices. The smoky oil lamp and the gas light with its flickering flame were replaced by carbon incandescent lamps of eight or sixteen, and in some cases thirty-two, candlepower. And what an improvement it was!

Electric illumination has been steadily and greatly improved upon since that time. The volume of light obtainable from the smaller sizes of present-day lamps, such as are used for desk lights, is as great or greater than that obtainable from the largest sizes of the old carbon lamps that were used for lighting large areas. The gas-filled lamp of the 100 watt size, very commonly used today, produces about five times as much light on less than twice as much current as the sixteen candlepower lamp of the early days.

The planning of illuminating installations is now on a scientific basis, and definite results are aimed at. The factors involved are the dimensions of the room, colors of walls and ceiling, type of unit to be used, etc. The problems to be worked out are the mounting height and spacing of the units, and the size of the lamps to be used. This illustrates the strides that have been made in the art.

Though much progress has been made, the good work has not ceased. The intensity of illumination is measurable, and intensities suitable for various classes of work have been determined upon. The measurement of illumination intensities has heretofore been a laboratory operation, but a small instrument called a foot-candle meter has recently been developed with which it is possible to check up illuminating installations.

Telegraph engineers in step with the march of progress along this line are using the foot-candle meter to check up illumination intensities in the various offices with a view to bringing the intensity up to the new standard wherever it is found to be below. The method of procedure is to apply the instrument to the working surfaces of tables, desks, etc., and record the readings. At the same time, observation is made as to the condition of the lighting units; that is, whether dirty or clean.

Consideration of the eyesight of employees and the realization that sufficient light promotes efficiency are back of the effort to keep the illumination of telegraph offices on a level with the best conditions found elsewhere.

THE OLD WIRE CHIEF says that he can patch anything but a pair of pants, and whenever that is necessary the old woman can do that. He believes in team work.

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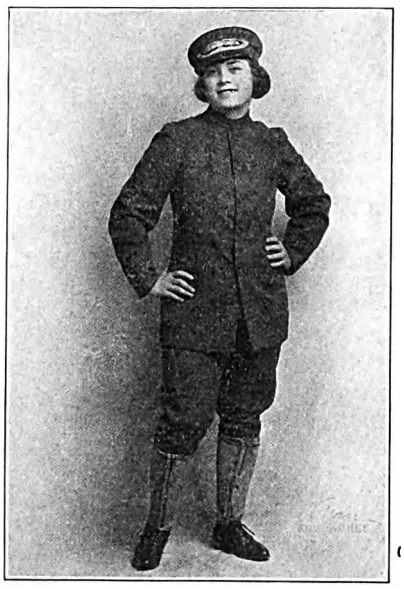
Milwaukee "Smile Party"

Miss Lucile Zeller, the subject of the accompanying photographic reproduction, made a great hit at the "Smile Party" of the National Safety Council, when she ran from a wing to the spotlight at stage center at the Milwaukee Auditorium on the night of September 28th.

Miss Zeller, who is "fair and scarce sixteen," represented a Western Union messenger in the Public Utilities division. Thirteen beautiful young girls, representing as many public utilities, all drew applause as they appeared on the mammoth stage one at a time, but Miss Zeller, assuming the jaunty, swagger bearing of a messenger, easily made the hit of the evening. She distributed up-to-date advertising matter to the audience, and many of the recipients insisted on paying her "tolls."



MISS LUCILE ZELLER

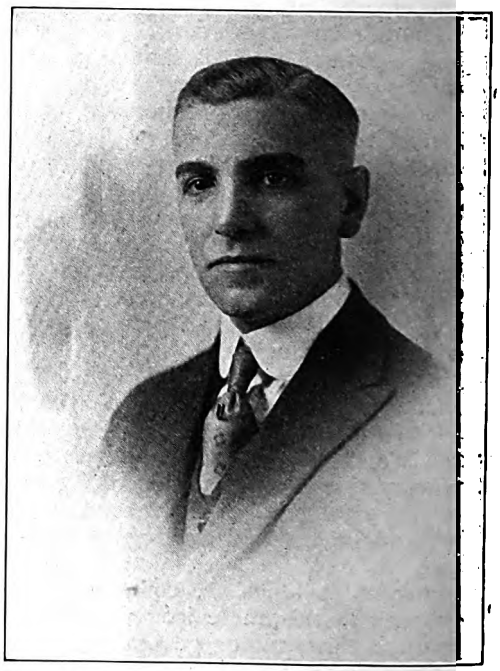
The "Smile Party" featured a series of entertainments given by the ladies during the ninth annual Congress of the National Safety Council, which was attended by 5,000 safety engineers, industrial managers, business executives, principals of schools and colleges, and public safety and traffic men representing all of the States. Four hundred exhibitors from all parts of the United States and Canada erected splendid exhibits at a great cost, the interests represented including railroads, mines, steel mills, chemical plants, electrical equipment manufacturers, safety equipment manufactures, cement plants, educational institutions and public utility companies.

The Western Union Telegraph Company established a branch office at the Auditorium during the week of the convention, and handled a heavy file of business daily.

WILLIAM HARRISON CONKLIN

Assistant Chief Operator, Canadian Pacific Railway Company's Telegraphs, Winnipeg

William Harrison Conklin, assistant chief operator, Canadian Pacific Railway Company's Telegraphs, Winnipeg, Man., was born in Hamilton, Ontario, and moved to Winnipeg when the family went to the western metropolis in the early eighties. After leaving the Collegiate Institute of that city, Mr. Conklin entered the service of the Canadian Pacific Railway Company's Telegraph as messenger, and, advancing through the checking force to delivery and receiving clerkships, was enrolled as an operator in 1897.



WILLIAM HARRISON CONKLIN

He went to the Postal Telegraph-Cable Company, Chicago, during the years 1901 and 1902, returning then to Winnipeg, where he stayed until leaving for the Pacific coast in 1905. While on the coast Mr. Conklin worked for the Western Union Telegraph Company at Portland and San Francisco, thence going to Lewiston, Idaho, for the Associated Press and Western Union Telegraph Company. Returning home in 1906, again to enter the service of the Canadian Pacific Railway Company's Telegraphs, he was appointed traffic chief and promoted to late night chief, early night chief, wire chief and at present is the assistant chief operator. He is one of the enthusiastic telegrapher curlers of Winnipeg, and is prominent in fraternal circles.

OWING TO SEVERE STORMS in Europe, telegraph communication in France, Germany, Italy and Switzerland was interrupted for several days early in December.

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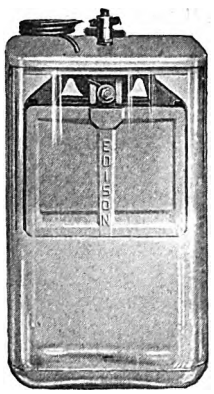
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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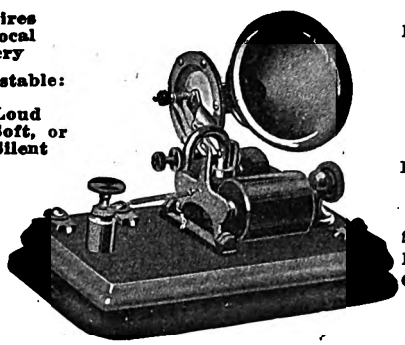
The Latest Improved Instantly Adjustable

DIAPHRAGM TELEGRAPH SOUNDER

Requires No Local Battery

Adjustable: Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

Practically as "Good as New" After Six Years' Service

Diaphragm Sounders have been in constant use in the office of the Norfolk Southern Railroad Company at Fentress, Va.

—More than six years
—Without a single local interruption
—Working as good now as the day they were installed
—And from all appearances they will continue to give the same dependable service for many more years.

Diaphragm Sounders are performing this class of service for the U. S. Govt., and more than one hundred Railroads, Pipe Lines and Oil Companies.

Equip your relays with Diaphragm Sounders

Descriptive folder on request

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MANUFACTURERS OF THE

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THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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Committee No. 4—protection against lightning r electrical light and power circuits—of the Telegraph and Telephone Section, American Railway Association, met in New York on December 6. In ddition to Chairman J. F. Caskey, Messrs. L. Behner, W. M. Gould, P. Norton, G. H. Mayer, A. W. Douglas, J. R. Larocque, P. A. Rainey, and H. W. Drake were present.

Considerable progress was made in the preparaion of specifications which the committee expects o present at the next meeting of the Telegraph nd Telephone Section.

Sub-committees G and J of Committee No. 2—onstruction and maintenance, inside plant—of the Telegraph and Telephone Section, American Railway Association, met in New York on November 30, December 1 and 2.

Sub-committee G is preparing manufacturing specifications for various materials and apparatus used in inside plant work. Its members are: Messrs. G. R. Stewart, Chairman E. V. Adams, R. F. Finley, R. A. Hendrie, and H. W. Drake. Mr. C. F. Stearns of the Western Union Telegraph Company's engineering department also attended this meeting.

Sub-committee J has in hand the preparation of drawings and specifications relating to circuits and current supply. Its membership is: Messrs. W. Rogers, chairman; A. Behner, C. H. Williamson, and T. Rogers. In the absense of Mr. Rogers, R. F. Finley acted as chairman.

O. A. ISHLER, formerly assistant supervisor of telegraph and signals, Baltimore division of the Pennsylvania system, has been transferred to a similar position, Panhandle division, central region, with headquarters at Pittsburgh, Pa.

FRANK G. ADAMS, circuit manager, Baltimore and Ohio Railroad Company, was a recent New York visitor.

THE UNITED STATES SUPREME COURT on December 6 refused to issue an injunction to the Western Union Telegraph Company restraining the Louisville and Nashville Railroad Company from removing its telegraph lines from the railroad's right of way.

Loss in Exchange Prompts Refusal of French Cables

Depreciation in exchange and refusal of the French government to agree to settlements on the gold franc basis, have caused the Western Union Telegraph Company to refuse cable messages for transmission from that country to the United States, Newcomb Carleton, president of the company, announced on December 7. The order, he said, became effective December 1, after the company had lost more than $1,000,000 during the last year because of the exchange situation.

The French Government's cable and telegraph administration, Mr. Carleton explained, required prepayment of cable tolls and these prepayments were on the basis of the depreciated paper franc. The charge on this side was in United States and other undepreciated coin, and the company paid the difference.

All America Cables, Inc.

CHIEF ENGINEER J. MOWAT of the cable ship *Relay* has returned to New York after an extended stay in the Gulf in connection with the laying of the new cable between Colon and Cartegena.

SUPERVISOR L. R. DYER arrived at Buenos Aires recently, having returned from furlough.

G. WOOLRIDGE of Buenos Aires left for Santiago, Chile, on company's business the last of November.

W. S. BUCHANAN, general representative at Rio de Janeiro, is visiting New York on company business.

CAPTAIN AND MRS. OLDHAMS of the cable steamer *Relay* returned to New York on the *Adriatic* from England, where they have been visiting friends.

J. A. LIGGETT, formerly manager at Buenaventura, has taken charge of the new office at Cartegena, Colombia, which was recently opened, giving direct cable connections from the North Coast to Colon.

OPERATOR R. S. HAMILTON has resumed duty at New York, having returned from furlough.

H. W. HAMILTON sailed from New York for Buenos Aires on the steamer *Vestris* November 28. He will be attached to Manager Hussey's force.

THE THIRD annual staff dinner of the All America Cables, Inc., will be held at the Whitehall Club, New York, on December 18, 1920.

THE FUNNEL BOWLING LEAGUE reports the All America Cables won three out of four games December 7, 1920, against teams of the Cunard Steamship Company and Norton, Lilly and Company. The high individual score held by Warner (243) of the United States Steel Corporation, passed into the background, as Pirie of All America Cables rolled 267.

J. GEGOU has been appointed manager of the French Cable Company at New York, to succeed Edward C. Sweeney, who retires on pension at the end of the year. Mr. Sweeney had charge of the interests of his company in the United States for the previous ten years.

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Radio Telegraphy

Review of Radiotelegraphy

E. J. Nally, president of the Radio Corporation of America, New York, in his address at a banquet given to the members of the International Communications Conference, on October 19th, at the Hotel Ten Eyck, Albany, N. Y., which was briefly referred to in a previous issue, made some valuable observations covering the development of radiotelegraphy.

He reviewed the development and expansion of the organization from the date the Government turned back the radio stations to private ownership, noting that, at midnight on February 29, "the first organized system of commercial long distance wireless communication between the United States and foreign countries was inaugurated." He explained that prior to April, 1917, when the United States entered the war, there had been a few weeks of commercial wireless service between this country and Japan, but the service could hardly be said to have been fully started before the stations were taken over by our government. Attention was called to the fact that transoceanic wireless communication is practically a new art and that everything in the organization, from the messenger boy up, had to be found—created, as it were, over night. "The staff which took over the stations from the government at the last minute of the day which was set for the transfer," said Mr. Nally, "had no opportunity to rehearse the multifarious duties connected with such a huge undertaking. We marvel that it could be done; but it was done, and the service has continued to this day practically without interruption, everyone fitting into his or her duties as though they had always performed them."

He explained that the first long distance commercial wireless circuit out of the United States was with Hawaii, which was soon extended to Japan. The second circuit was with England; the third, beginning in May of this year, with Norway; and the fourth, a few months later, with Germany, and that it is now planned to start a fifth, with France, at the beginning of next month.

"This nation is today the only country in the world carrying on commercial communication by wireless with four other nations," he said, "and the Radio Corporation of America is the only company in this country owning and operating high power radio stations that communicate with other countries. In addition it has under way the erection of a huge multiple station in the vicinity of New York City, which, when completed, will enable it to communicate with many other foreign countries, including South America All of this service has been developed practically within the year."

Mr. Nally expressed the belief that never in the history of initial industrial development in any country have there been such large expenditures of time and money as those called for by the radio art. "The first high power radio stations required the expenditure of millions of dollars and verily they were built on faith," he observed, "but the faith which removes mountains justified itself in radio, where the obstacles to successful operation were stupendous. The pioneers were men of vision and their hopes, though great, have been in a large measure realized."

He viewed the business of international radio communication as one wholly different from any other scheme of communication, in that each nation, by the nature of things, is limited to the building of its own station—only one-half of the circuit. The other nation must supply the complementary station. For the guests—whom he characterized as the "doyens of communication"—he developed the thought that:

"Any nation, having erected its station with all the skill and technical experience at its command, must trust in sublimest faith to the other nation to make its station a complementary one—and a full complement. To the extent that this is done the purposes of both nations shall have been accomplished; but, if instead, one station has less power or is less efficiently organized, and maintained, or for any reason fails to meet the full standard requirements of the corresponding station, it renders abortive the best plans and the highest skill of the other nation."

He stated that, primarily, there must be organization with a trained staff and up-to-date apparatus and devices, and coupled with this there must be the closest and most intelligent supervision and coordination on the part of governmental and private connecting land lines.

"It is not enough to provide stations of the greatest power if that power be drained and dissipated by leaky and wasteful systems of pick-up and delivery or by slow service through the transfer offices of connecting lines," he continued. "We all know that many relays, whether manual or mechanical, are as brakes on the wheels of traffic progress. A speedy main line circuit contributes to minimize delays, but such contribution is in turn itself minimized, indeed made abortive, if not adequately supported by the feeding and distributing ends of the circuit. By eliminating the necessity for inspection and checking, and the accounting processes, we reduce delays, disbursements and waste.

"If the remedy were in the hands of one organization it would be easy to place responsibility and bring about needed reforms; but, speaking for the Radio Corporation as a typical instance, though it constructs its stations in accordance with the latest improvements in the art, sparing neither effort nor money, and though it provide a twelve-inch main

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r traffic, if it must feed it through a one-inch pipe either end, its efforts and accomplishments are duced to the capacity of the one-inch pipe.

"Therefore, I respectfully but earnestly suggest you who control the communication of your re-ective countries, and are in daily touch with the velopments in every art and every method which e contributing to the progress of communication, e imperative necessity at this time, when so much expected and so much has already been accom-ished in radio, of supplementing its great potential ssibilities with every improvement which intensive udy and careful supervision can bring about, to e end that every link in the chain of service will e of equal strength and all unite to form the high-t standard of excellence.

"I suggest, as the most definite and satisfactory an which will bring all connecting companies into ne and co-ordinate their organizations, that we augurate a system for the exchange of engineers, upervisors, and even operators; thus enabling our affs to obtain a complete insight into the working onditions and the local difficulties of the station or ations with which international communication is xchanged. Fortified by such complete understand-ng we shall be better able to iron out the minor efects which oft-times become very troublesome in eir cumulative form.

"The expense of making this exchange can be essened for all concerned by an arrangement under hich the personnel exchanged would assume defi-ite duties at their temporary posts and be carried n the local payroll."

Mr. Nally then discussed the human element in adio. Is it enough, he said, to have highly skilled ngineering and research departments constantly en-aged in overcoming mechanical and natural diffi-ulties incident to the operation of high power radio tations, calling for vast expenditures of time and noney, and, regardless of cost, regularly consigning o the scrap heap the development of today for the mprovement of tomorrow? He maintained that he logic of the case calls for the building up of a ighly competent, contented and capable staff, where he members will feel upon entering the service that t is a business to which they can devote their lives nd their best efforts, with assurances of a fair eturn in the way of income during the time they erve and a substantial pension to take care of them hen, through years or other incapacitation, they re unable to work.

"While I know that in many countries such a cheme has been applied, to a degree, perhaps, be-ond anything that is in practice here," he added, I nevertheless have the feeling that nowhere has nough attention been given to the human element n the vast machinery of communication; and before e can expect the full measure of performance rom highly developed apparatus there must be an qually developed organization, complete in every art, co-operating with highest enthusiasm and skill n every step of the march of progress and improve-ent. In view of the large investment in high ower radio stations anything short of a co-ordinating organization of trained experts is economic waste."

His observation, he stated, had been that the traffic has suffered greater delay through physical failure of land lines and their operation than from physical failure of radio transmitting apparatus, including aerials, and that radio service is made or marred by the careless or incompetent operator or messenger, or both.

He explained: "Telegraph service, as I know it (and I have been intimately connected with it for forty-five years) while perfected to the last degree mechanically, is dependent upon the human element for its best expression, and while great progress has been made in training the operator—and the average operator is capable, and conscientious—the messenger boy, alas, is the same unknown quantity he was in the beginning, and evermore shall be!

"We should carefully and systematically study ways and means to substitute for the messenger a trained man of the type used for the delivery of mails and supplement him by all available mechanical devices, such as telephones, pneumatic tubes and intercommunicating systems or automatic recording devices between the main office of the telegraph company and the business office of the customer, for sending and receiving messages.

"I am strong in the belief that the ideal telegraph service, wire or wireless, will not be realized until we scrap the messenger boy. He is the one antiquated piece that remains of the human side of commercial telegraphy. The period of his obsolescence is contemporaneous with the birth of the first messenger!

"Having been a messenger, I speak from experience, as well as from conviction born of many years of association with the species of the dear, derelict and delayful darlings to whom we telegraph people have entrusted the star part of the whole drama of service.

"I do not want, however, to lay all the stress on scrapping the messenger," he concluded. "I would scrap *every* antiquated, and therefore obsolete, feature of the system which has been built on tradition and is still religiously followed. In other words, I would match the new art of improved apparatus and devices with up-to-date methods of operating same in co-ordination with the new ideas and systems to be regulated by the improved human machine."

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Radio Corporation of America

ELMER E. BUCHER has been appointed commercial engineer of the commercial department, in charge of foreign, amateur, United States, and miscellaneous sales.

G. HAROLD PORTER has been appointed general superintendent of marine division and T. W. STEVENS, assistant general superintendent, with headquarters at New York.

C. F. NELSON, for several years with the Western Union cable staff at New York, has been appointed telegraph engineer of the traffic department of the Radio Corporation of America.

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PIERRE H. BOUCHERON has been assigned to the commercial department and is handling general publicity and advertising matters.

H. C. GAWLER, formerly inspector for the department of commerce in the Boston district, has been assigned as assistant in the sales division of the commercial department.

C. H. TAYLOR, assistant chief engineer, has received a gift of a valuable watch from his former associates in the British Marconi Service on the occasion of his recent marriage.

CAPTAIN MAURICE BROSSIER of the Campagnie Generale de Telegraphie sans Fil recently arrived from Paris in connection with the opening of the Trans-Atlantic Radio Circuit, December 8, at Tuckerton, N. J. Besides visiting that station, he also inspected the high power station at Marion, Mass., and the city telegraph office at 64 Broad Street, New York.

MESSRS. Seth Ljungquist, Enstrom, Lemoine and Professor Pleijel of Stockholm, who have been in this country some weeks representing the Swedish Department of Posts and Telegraphs, paid visits of inspection to the high power stations at Belmar and Tuckerton, N. J., and Marion, Mass., before sailing for home December 11. Prior to sailing they were entertained by President Nally at a dinner and theatre party.

Condenser Antennae

Experiments have recently been made at the Bureau of Standards upon a special type of antenna for transmission and reception of radio signals. The antenna consists of a pair of metal plates. It is thus similar to the ordinary antenna arrangement, the wires of the ordinary antenna corresponding to one plate of the condenser antenna and the ground below the wires corresponding to the other plate of the condenser antenna. When the lower plate of the condenser antenna is on the ground, the two types are practically identical. It is found, however, that raising the lower plate from the ground improves the signals. This type of antenna has the advantage that it is not subject to disturbances and irregularities produced by objects on the ground.

The work done included the construction of various forms of condenser antenna and measurement of the capacity and other electrical properties. This type of antenna was compared with coil antenna which are used as direction finders. For the very short wave lengths, such as are used in radio communication by amateurs, the condenser antenna gave more intense signals than the coil antenna of the same general dimensions. Compared with the ordinary antenna with which a ground connection is used, the condenser antenna is markedly free from electrical disturbances.

Submarine Radio

The annual report of the Bureau of Standards states that members of the Bureau's staff have developed very successful methods of communicating with submerged submarines by radio-telegraphy. With a single-turn coil or loop attached to the outside of the submarine, signals can be received as well when the vessel is submerged as when it is at the surface. It is also possible to transmit from a submerged submarine a distance of twelve miles. Thus it becomes possible for a ship and a submarine to exchange recognition signals. A coil aerial is a satisfactory direction finder when submerged and readily receives signals transmitted thousands of miles, just the same as when used in the air. The navy has equipped its larger submarines with this apparatus.—*Scientific American.*

Industrial

LIKE AN OLD FRIEND in a new dress, the new 1921 edition of Hendrick's *Commercial Register* came to us this year in a bright attractive shade of red with black lettering, and at once drew our attention. A study of the book revealed that the publishers had maintained the high standard of this book which it has enjoyed for the past twenty-nine years, having retained all of its good features, and have added some new ones. The price is $12.50, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THOSE RESIDING in New York and vicinity wishing to purchase Diaphragm Telegraph Sounders will find these instruments on sale in the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. The price of these instruments is $5.00 each. There is an increasing demand for these sounders, and those in need of them will no doubt be glad to learn that they are now obtainable in New York.

BUSINESS CONDITIONS in Europe are slowly improving, says A. F. Adams, president of the Automatic Electric Company of Chicago, who has just returned from a tour of inspection of associated telephone companies and factories in England and other European countries. Mr. Adams is of the opinion that business in Europe will stabilize rapidly as soon as the political situation settles down to well defined lines. He says labor is growing more earnest and industrious and that manufacturers in many of the countries, including Germany, told him their prospects for a large volume of trade were bright.

During the war Mr. Adams was one of the board of four in charge of the telephones and telegraphs, and he supervised the Postal Telegraph-Cable Company under government control.

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Measurements of Earth Potentials

By J. W. MILNOR

It is a well known fact that during times of displays of aurora borealis there occur disturbances to telegraph operation. If a wire a few hundred miles long is grounded at each end a current will be caused to flow in the wire at such times, and if a voltmeter is inserted in the wire it will be found that voltages sometimes as high as 100 or 200 volts, varying from negative to positive, will be indicated by the meter. Disturbances from this cause practically disappear excepting during the so-called "magnetic storms" that accompany displays of auroro borealis.

It is perhaps not so well known that local electric railway or trolley systems also cause disturbances in the earth that may have a detrimental effect upon telegraph operation. Disturbances from electric railways are local in extent, the earth in the immediate neighborhood of the railway system alone being affected. The effect of an electric railway usually disappears a few miles from the railway. In some cases, however, particularly where the railway is of considerable extent, or where interurban electric railways are operated, earth disturbances may extend ten or twenty miles or more from the trolley system. In the remainder of this article attention will be paid only to disturbances due to electric railways. It will be assumed that disturbances due to aurora borealis are absent, since as a matter of fact they occur only at intervals separated by considerable periods of time.

Disturbances due to electric railways may be spoken of in technical language by saying that they cause an "earth potential" at the city under consideration. Excepting where such disturbances occur, the earth is everywhere neutral. The greatest earth potentials or voltages are likely to occur during rush hours in morning and evening, when the railway system does its greatest business. During the very early morning hours it often happens that the potentials disappear entirely. It is quite common to find earth potentials as high as 5 or 10 volts due to electric railways, while in a few instances voltages of 50 to 100 volts have been observed.

In order to make measurements of earth potentials it is necessary to establish some "base point" in the country, and to make measurements with reference to this point. For example, a measurement made, say, from New York to Boston would be of no value as an indication of the character of the earth at either city, for the reason that it would not show whether the earth at New York, or the earth at Boston, or at both points, were disturbed. If, however, a measurement at either city is made to a base point which is known to be of neutral potential, then the conditions at that city are definitely made known. In order to locate a suitable base point it is necessary to have some knowledge of the layout of electric railways in the neighborhood. If possible, the base point should be at least 20 miles from the nearest electric railway. Sometimes it may be necessary that the base point be 50 or 100 miles from the city under observation, this distance being made necessary to obtain a point sufficiently distant from possible earth disturbances.

In measuring earth potentials a wire is simply grounded at the chosen base point and at the city under observation, a direct current voltmeter being connected in series with the wire. The voltmeter should be watched for a few hours in order to obtain maximum and minimum readings. It is preferable that the readings be made during hours when the railway does its greatest business.

It is very desirable that tests of the base point itself be made in order to make sure that it is suitable for the purpose. In order to test a base point it is necessary that some second base point be chosen. The two base points should be at least twenty miles distant from each other. A test may be made between them by means of a voltmeter; observations being continued for, say, a half-hour to make sure that there is no disturbance. In case it should be found that there is a voltage difference between the two base points it indicates that at least one of the points is not suited for the purpose. A third base point should then be chosen, and additional measurements should be made until it is proven that a base point has been located of neutral potential.

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Miami, Fla., Western Union Cable

The whole question of cable landings in the United States, including the present controversy between the Western Union Telegraph Company and the State Department, is to be investigated by a Senate committee, it was announced by Senator Kellogg a few days ago.

Senator Kellogg said the inquiry would be held in connection with his pending bill proposing to empower the State Department to regulate cable connections in this country. It is expected that there will be a complete airing of the refusal of the State Department to permit the Western Union Telegraph Company to land at Miami, Fla., a cable from Barbados, which would connect there with a British cable line—the Western Telegraph Company—to the east coast of South America.

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The Proposed Government Pacific Cable

Passage of the bill creating a government commission to begin at once the laying of a government cable across the Pacific Ocean will be sought by Senator Jones of Washington, who introduced it during the previous session. Mr. Jones declared the urgent need of the cable makes it necessary for the government to lay it.

"Private corporations contemplated such a cable," said Mr. Jones, "and the committee was urged not to authorize a government cable for that reason. But nothing has been done, and I believe the government should act."

The bill provides that the Secretary of War, Secretary of the Navy and Secretary of Commerce shall decide on the route of the cable and begin its construction. An appropriation of $5,000,000 is provided, but hearings on the bill developed the fact that the cable would cost at least $25,000,000.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

GENERAL MANAGER A. B. COWAN of Denver and U. G. Life, superintendent at Salt Lake City, held a conference with office managers at Helena, Mont., on November 21 to discuss plans for the new year.

W. A. PORTEOUS, city superintendent, New Orleans, La., was recently elected president of the New Orleans Rotary Club, with which he has been prominently identified for some time.

CECIL W. MACKENZIE, for many years right of way agent for the New York Telephone Company at Buffalo, N. Y., has retired on pension. Mr. Mackenzie will spend most of his time hereafter at his country home at Fort Erie, Ontario. He will have plenty of time to cultivate his literary tastes and he expects to attend many meetings of the Tel-

WESTERN UNION TELEGRAPH CO.

A. ATHERTON of the plant engineer's office recently spent several days in Atlanta on business.

J. L. NIESSE, telephone and telegraph engineer of the Big Four Railroad, was a recent engineering department visitor.

L. H. ROVERE of the plant engineer's office has returned from New Haven, Conn., where he had been on business for the engineering department.

R. C. FOLGER, district commercial manager, Fourth District, has been appointed office manager in General Manager T. W. Carroll's office.

T. B. CLARK of General Manager T. W. Carroll's office is visiting Havana, Cuba, in the interest of the service.

E. B. SYLE, Philadelphia, has been appointed district commercial agent, Fourth District.

F. L. KELLOGG of General Manager T. W. Carroll's staff, who has been absent from duty for some time, is reported seriously ill.

Western Union Eastern Division

C. L. STEWART has been appointed commercial agent at Syracuse, N. Y.

GEO. A. SHREAD, manager at Westfield, N. Y., has been transferred to Hornell, N. Y., as manager.

WM. D. SHEDD of Olean, N. Y., has been appointed manager at Niagara Falls, N. Y., succeeding Mr. Walsh, who has gone into other business.

S. C. SIMONTON of the Olean, N. Y., office has been appointed manager, vice Wm. D. Shedd, transferred.

MISS MARY POWERS, operator at Ilion, N. Y., has been transferred to the Niagara Falls, N. Y., office.

PRESCOTT MOREY, formerly manager at Bath, N. Y., has returned to the service at that point, succeeding Mary Drobryk, who was appointed manager at Waverly, N. Y.

New York Western Union

RECENT VISITORS to the central office at 24 Walker Street included Messrs. Rhoads, Jackson, Baxter, Bates, and Gilchrist, telegraph engineers associated with the New York Central lines.

A PARTY of members of the Brooklyn Institute of Arts and Sciences were shown through the various departments at 24 Walker Street on December 4.

AT A recent beauty contest Miss Margaret Ryan of the operating department was declared to be the prettiest girl.

THE Commercial News Department Bowling Team are so far leading the Telegraph League. Messrs. Bellis and Sugar are reaping rewards for their hard work.

DAN O'HARA has been transferred from the main office to an uptown branch office as supervisor.

ALBERT E. WILGUS of the commercial news department, who is home on sick leave, is improving.

S. C. CRUMPTON, assistant chief operator in charge of distributing center, has accepted a position with the National City Company. The best wishes of his associates go with him.

D. C. JERMAIN, senior supervisor, distributing center, late night tour, died of heart failure Sunday, November 21.

MISS MARGARET JOHNSON, aged twenty, employed as city route clerk, was killed November 21 in an automobile accident. Several others in the same car also employed at 24 Walker Street were injured.

ON DECEMBER 6 the New York-Seattle multiplex was inaugurated, starting with a speed of 53 words per minute. The circuit is supervised by Miss Anna I. Burns, one of our most efficient supervisors.

J. F. W. ULRICH of the testing and regulating department has been granted a furlough of thirty days.

F. G. LIGHTFOOT of the testing and regulating force has been transferred from the day to the early night tour.

WALTER MCGRATH has the sincere sympathy of all of his friends in the death of his nine-year-old son.

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H. A. NEIGHBOR, repeater attendant, has been transferred from day to night duty.

A HIGH FREQUENCY set has been installed in "Qd" and within the past week has been operating successfully as a duplex to Easton, Pa. In a few days it is expected to start the same operation to Harrisburg, Pa., over the same wire, which also carries a multiplex.

TESTING and Regulating Assembly, No. 78, Association of Western Union Employees, held its regular monthly meeting on December 9, and elected the following officers for 1921: President, F. C. Licari; vice-president, F. W. Streeter, J. F. W. Ulrich, secretary-treasurer. The meeting was largely attended, considerable interest centering in the co-operative club proposition, a newly formed organization of Association of Western Union Employees members whereby they can purchase clothing, foodstuffs and other necessities at almost cost prices. The Assembly expects in the near future to hold a theatre party and dinner, which from the preliminary "buzz" bids fair to be a very successful one.

MRS. J. F. WILSON, wife of J. F. Wilson, district commercial superintendent, Dallas, Texas, is in New York, visiting her parents, Mr. and Mrs. J. P. Edwards. Mr. Edwards is assistant to Vice-President of Traffic W. N. Fashbaugh.

MRS. A. M. MCQUOWN of Washington, D. C., has relieved Miss A. R. Potter, supervisor of the stenographic bureau of the division traffic superintendent.

C. J. ELSDEN, formerly chief of the statistical bureau, has been appointed chief clerk to Division Traffic Superintendent S. B. Haig, vice S. B. Lomas, who has been transferred to duty in the analytical bureau.

W. J. QUIGLEY has been appointed chief of the statistical bureau, vice C. J. Elsden.

E. D. PITT has been appointed division traffic supervisor of the metropolitan division, headquarters, 24 Walker Street.

HARRY BUTLAND and J. V. HUNT, formerly section supervisors, Morse department, have been transferred to the division traffic superintendent's office.

MISS A. R. POTTER has been appointed to a clerical position in the division traffic superintendent's office.

SIDNEY B. LOMAS has recently returned from a three months' trip to his old home in England.

E. M. CLARK, for many years in the Morse department of the Kansas City office, has been transferred to the New York main office.

EDWIN A. CASPER, on the staff of Division Traffic Superintendent Haig, graduated as a doctor of chiropractic from the New York College of Chiropractic last Spring, and has opened offices in the Shubert Theatre Building, Broadway and Monroe Street, Brooklyn. Dr. Casper had been in the service of the Western Union Telegraph Company since January, 1912, when he started in the division plant office as stenographer at Dallas, Texas. During the recent war he was commissioned second lieutenant in the Signal Officers Reserve Corps, which rank he still holds.

WITH A LARGE NUMBER of members in attendance, Brooklyn Assembly, No. 131, Association of Western Union Employees, held its eleventh and probably last meeting of the season at the Eagle Auditorium, Eagle Building, Brooklyn, on November 30. President J. P. Donovan presided, and soon disposed of routine business, after which R. F. Murphy, vice-president of the Metropolitan Division, and M. M. Green, delegate at large, were introduced. They were given a hearty ovation, brief talks were given of the association's purpose and accomplishments. Mention was made of the dance to be held January 25 at the Imperial. Fall foliage and Japanese lanterns effectively decorated the hall.

Western Union Lake Division

THE FORCES at Marion, Ohio, are now enjoying a well-earned rest due to the absence of President-elect Harding, but expect a spirited revival of business upon his return home early in December. The file in and out of Marion since the nomination of Senator Harding in July has been of enormous proportions and has taxed the working capacity of not only the regular forces at the uptown office, but of the dozen or more testing and regulating employees at the repeating station there.

A MEETING of the local commercial forces at Canton, Ohio, was held on Friday evening, November 12, presided over by District Commercial Manager Bowen, and at which a number of out-of-town managers were present. The meeting was an enthusiastic one and augurs well for an intensive business development campaign at that point.

MANAGER L. M. WITHERS, Gallipolis, Ohio, reports a nine-pound addition to his family circle.

MISS THELMA BURRIS, manager at Mt. Gilead, Ohio, had her arm broken while returning from a football game on Armistice Day, which will likely place the young lady "hors de combat" for a few weeks. Wilbur Pitzer, who recently graduated from the Western Union school of instruction at Niles, Mich., is temporarily in charge of the office.

E. A. DENSMORE of our vacation relief force recently exchanged positions with Manager F. H. Smith, Xenia, Ohio, the former also having just completed a course of coaching at Niles, Mich.

SALEM, OHIO, is now experiencing a "reign of terror" due to the typhoid fever epidemic which has been raging for several months, but which has, fortunately, not attacked any of our local forces up to this time, and as the disease is now well under control, the prospects are good for their escaping.

MANAGER G. W. ANDERSON, Blanchester, Ohio, was married November 13, and is now combining

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his vacation with his honeymoon in a trip to relatives in the South.

MANAGER WALTER BRANCH, Middleport, Ohio, one of the landmarks of the fourth district, expects to return to duty shortly, he having been absent on a furlough.

A. J. DUQUAINE has been transferred from Green Bay, Wis., to the managership at Moline, Ill., vice L. L. Miller, resigned to enter another line of business.

A. C. ALWINE, manager, Galesburg, Ill., transferred to the managership, Elkhart, Ind., and is succeeded by J. P. Smart, who has just returned from military service. Mr. Smart was formerly manager at Kenosha, Wis., and enlisted in the Signal Corps at the outbreak of the war.

F. J. Corrigan, transferred from Ottawa, Ill., to Waukegan, Ill., vice W. L. Prater. The latter was promoted to the managership at Rock Island, Ill., relieving J. C. Calkins, resigned.

G. V. O'CONNELL, appointed manager, Kenosha, Wis., vice E. J. Rasico, resigned. The latter is now proprietor of a cleaning and dyeing establishment at Kenosha, Wis.

F. J. CORRIGAN, manager, Waukegan, Ill, joined the ranks of the benedicts recently. G. A. Tramp, manager, Bloomington, Ill., listened to the strains of Mendelsohn's March Thanksgiving Day, and New Year's Day will be celebrated by B. C. Nelms, manager, Springfield, Ill., by taking a "leap in the dark." Their many friends and business associates wish them happiness during their journey down the long trail.

A. L. WELLINGTON, for many years chief clerk to Superintendent E. Boening of Detroit, Mich., for the past year located at Indianapolis, Ind., was a recent New York and Boston visitor.

Milwaukee Western Union

The Florists' Telegraph Delivery Association's display in the five large windows in the Milwaukee main office was a riot of color and beauty. It was in from October 31 to November 6, inclusive Chrysanthemums, being the seasonal flower, predominated and were variegated as to size and color. There was also a fine display of American Beauty, Columbia, Killarney and other species of roses and smaller roses such as the "Baby Doll" in profusion in basket displays. The temporary bulkheads in semi-circle form gave a six-foot depth in the center of each window, and the flowers were arranged so that the effect was one which at once attracted the eye of the passerby on account of its beauty.

The bulkheads were covered with moss and a pole line carrying four copper wires ran from "San Franciso" to "New York" with a cut-in at "Milwaukee," and Morse instruments located at the terminals.

This display was designed to advertise the sending of flowers by wire, and a young lady attendant in charge of the flowers gave the information concerning the procedure to be followed in the sending of flowers to points throughout the United States and Canada. Pedestrians by the score stopped to admire and made flattering comments, some desiring to buy the flowers. The display will probably be repeated during Mother's Day week next spring.

The New Western Union Office in Chicago

Work on the new main office of the Western Union Telegraph Company, Chicago, is taking rapid strides. The following departments are now occupying the new building:

General manager, district and city superintendents, division traffic superintendent, division plant superintendent, division auditor, and bookkeeping department.

Messrs. E. Harvey, A. H. Morgan, Wm. V. McGuinness, S. M. Barr and Wm. Ramhorst of the plant engineer's office, New York, are now in Chicago lending their assistance toward the completion of the work.

Toledo, Ohio, Western Union

About forty men employees of the Western Union Telegraph Company, at Toledo, Ohio, met at the home of former Night Chief Operator George E. Crapsey, 921 Detroit Avenue, Tuesday evening, November 30, where a very pleasant time was enjoyed by all concerned, particularly by Mr. Crapsey, who is on the retired list, and who has been in poor health for the last two years. The visit in a body of his former comrades and coworkers was an epoch in Mr. Crapsey's enforced home life, which will never be forgotten. It would be a hard matter to find a finer gathering of representatives of the telegraph profession in any city than joined hands in a spirit of good fellowship on this occasion. A fine luncheon was followed by a smoker, and the relating of many humorous episodes and experiences by the "Old Timers" of the old telegraph days, which have now passed down into history.

Two weddings occured on Thanksgiving Day which will interest the older employees of the Toledo office. One was the marriage of Miss Sarah Hebbeler, former commercial department employee of this office, to Medard Keogh; and Miss Elsie Langhoff, former traffic department employee, who became the bride of John Vordeburg. Both young ladies have many friends in the office, whose good wishes will attend them.

Cincinnati Western Union

J. D. PRICE of J. C. Willever's staff, New York, was a recent visitor here.

ON A TYPICAL "shower" night, the commercial forces attended a shower on Miss Marie Breitenfeld at her home. Marie recently retired to become Mrs. James Bolton. Mr. Bolton works the fast Charleston wire here.

CHAS. R. LAIB, commercial agent on City Superintendent Scholl's staff, has resigned to go into other business, and has been succeeded by Joseph J. Beyersdorfer. Mr. Beyersdorfer is the present grievance man for the commercial department here.

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THE SUCCESS which attended the musical play presented by the members of Local 51, Association of Western Union Employees, prompts the sponsors to attempt another.

GEO. W. KEITH, JR., delivery clerk, has written three one-act plays, which will be presented shortly by this talent. One of the playlets has the alluring title, "If I Owned the Western Union." What would you do if you owned the Western Union?

POSTAL TELEGRAPH-CABLE COMPANY

Postal Grants Big Increase in Wages to Steady Employees

Edward Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company, made the following announcement:

"Effective December 1, the Postal Telegraph-Cable Company will advance its charges for interstate full rate fast commercial telegrams and establish the same rate for this class of business as its competitor, the Western Union Telegraph Company, has charged since the first of April, 1919. Telegrams between stations within the state will still be twenty per cent. lower than competitor's rates.

"Since its lines were returned to private management on August 1, 1919, the Postal has given the public day service at a rate twenty per cent. lower than that of its competitors. It has continued to give the public the benefit of this rate, notwithstanding that changing conditions were constantly adding to the cost of operation.

"It is now necessary to increase its charges to meet a greatly increased cost of operations to properly maintain its existing lines and increase its facilities so the service may be further extended and improved, and also to increase the wages of the large staff of employees who stood by it so loyally during the troublesome period following the disorganizing effect of government management of its lines.

"Since the management of the Postal Telegraph system was returned to its private owners by the government on August 1, 1919, it has erected on existing pole lines over 25,000 miles of copper wire to provide facilities for a greatly increased business and to improve the service generally.

"It has also extended its pole lines to points not previously reached by it to meet the demand from the business public for a competitive telegraph service. The Postal is the only possible competitive telegraph system in the field at the present time, and the business public appreciates fully the benefit of its efficient and aggressive competition and will support the company in its present movement to increase its facilities and increase the wages of its employees.

"The wages of all regular employees (with the exception of gang foremen and their crews and messengers, both classes of which have already been provided for) up to and including district superintendents will be increased ten per cent. from December 1."

C. F. LEONARD, superintendent, has recently returned from a trip during which he visited all the important offices in his district.

C. M. BAKER, general superintendent of plant, Chicago, Ill., was a recent executive office visitor.

RUFUS GOULD of the plant department has been making an extended inspection of lines through the States of New York, New Jersey and Connecticut.

THE SYMPATHY of his friends are extended to Charles E. Stump, manager of the Dock Street Office, Philadelphia, in the death of his wife, who passed away on November 10, after a lingering illness of six months.

Managers Appointed

E. A. Slayton, Chattanooga, Tenn.; C. B. Thompson, Natchez, Miss.; Howard Jolly, Lynchburg, Va.; C. A. Nichols, Lamar, Col.; A. E. Ledet, Baton Rouge, La.; M. J. Merrimon, Aiken, S. C.; M. E. Bourke, Kewanee, Ill.; Wm. A. Salmon, Ottawa, Ill.; H. J. Barnes, Kissimmee, Fla.; Gertrude B. Gregg, Ontario, Cal.; H. C. Dolby, Oil City, Pa.; Angie W. Corey, Alton, Ill.; W. P. Bennett, Idaho Falls, Idaho; Margaret Gaspar, Owosso, Mich.; A. L. Lanshart, Daytona, Fla., new office; R. W. Ogle, Port Huron, Mich.; M. C. Halladay, Lansing, Mich.; Clara S. Rourke, Flint, Mich.; C. M. Robbins, Ottawa, Ill.; Leslie Garner, Everett, Wash.; and G. V. Mitchell, Meridian, Miss.

A MEETING of the shareholders of the Serial Building Loan and Savings Institution of New York will be held in the office of the corporation December 21, at 5 P. M., for the purpose of nominating officers and directors.

THE ANNUAL MEETING of the shareholders will be held at the same place at 5 P. M., January 18, 1921. Polls for the election will be open from 2 P. M. to 5 P. M.

OBITUARY.

CHARLES W. DOUGLASS, aged seventy-seven, who was identified with the Western Union service for over forty years in the district superintendent's office at Cleveland, Ohio, and who resigned a few years ago to enter other business, died at Troy, Ohio, November 3. Mr. Douglass was chief clerk to Superintendents E. P. Wright and C. Corbett at Cleveland, and was well known to the fraternity in the Middle States.

JOSEPH SCHERRER, aged eighty-five years, father of Franklin J. Scherrer, secretary to Colonel R. C. Clowry, New York, died at his home in Chicago on November 7. Mr. Scherrer had a unique record in that he had worked for one firm continuously from 1858 until 1915, when he retired from active service. The Old Settlers' Association of Chicago awarded Mr. Scherrer a gold medal for his long and continuous service.

GARRETT S. MOTT, aged seventy-five years, president of the Bankers and Merchants Telegraph Company in the early eighties, and a well known old time telegrapher, died at White Plains on December 4. Mr. Mott was the inventor of three sys-

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tems of duplex telegraphy. In 1884 Mr. Mott became general manager of the amalgamated opposition companies. He was born in Trenton, N. J., and served through the Civil War. He began his telegraph career as a messenger, soon becoming an operator. He was selected to work the first direct wire between New York City and Montreal. He retired from active business several years ago, since which time he had lived with his daughter.

Tablets to Tell of First Fire Box

Inasmuch as the first alarm of fire on a fire alarm telegraph system was struck in Boston, Fire Commissioner John R. Murphy is planning on commemorating that achievement by placing a small tablet in the fire alarm office at the Bristol Street headquarters and in the fire station on Mason Street.

The idea of a telegraph system of sounding an alarm of fire was conceived in Boston by Dr. William F. Channing in 1845. Not being a practical man, he sought the electrical skill and knowledge of Moses G. Farmer, who later successfully worked it out. Josiah Quincy, then mayor of Boston, was interested in the project and in 1848 two machines were ordered by the City Council for striking the bells.

In 1851, $10,000 was appropriated in the city of Boston for a fire alarm telegraph system, which was built and completed on April 28, 1852. The first alarm of fire on a fire alarm telegraph system was struck on Boston bells April 29, 1852, the first time in the world's history. The box from which the alarm was struck was located on the Cooper Street Church and the fire which caused the box to be struck was at the corner of Charlestown and Causeway Streets.

Honoring Ampere

Ampere, N. J., on December 4 honored the French genius from whom it got its name. One hundred years ago Andre Marie Ampere announced the laws governing the action of a wire, carrying a current, upon a magnet. The development of electric power machinery since has been based on these laws.

Twelve years ago a bronze memorial tablet was unveiled in honor of Ampere in the town which bears his name. Jules Jusserand, the French Ambassador, was the orator on that occasion. On December 4 the French government was represented at the centenary exercises by the Prince de Bearn et de Thalias, charge d'affaires and counsellor of the French Embassy at Washington.

The prince made a brief address on the work of Ampere. Other speeches were made by Dr. Schuyler S. Wheeler, president of the Crocker-Wheeler Company; Dr. M. I. Pupin, an authority on long distance telephone development, and Dr. C. C. Mailloux, past president of the American Institute of Electrical Engineers. There were about one hundred out-of-town guests present.

The Federal Telegraph Company

The Railroad Commission of California on November 30 authorized the issuance of $500,000 in bonds by the Federal Telegraph Company to erect four wireless stations. The bonds will bear eight per cent. interest. The stations will be built on the Pacific Coast—one at Palo Alto, one near Portland, Oregon, and one near San Diego, and one new near Los Angeles.

Construction of the stations has been made necessary by the termination of an agreement the Federal Company had with the Pacific Telephone and Telegraph Company under which the latter named company transmitted messages received by the Federal at its wireless plants, but which it could not forward because of lack of facilities.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

Holland Protests Retention of German Pacific Cables

The government of Holland has served formal notice that it has a large financial interest in the former German Pacific cables, and will appeal to the League of Nations if Japan insists on keeping them. This fact developed at a session of the International Communications Congress at Washington on December 6.

By such action Holland literally becomes an ally of the United States in her controversy with Japan, which claims the right to exclusive control over the cables and the cable station particularly on the Island of Yap. It is on this island that the Pacific cable from the United States connects with the German cable to Shanghai.

In her note Holland sets out that when the cable was constructed Dutch investors contributed capital almost, if not quite, equal to the amount invested by Germany, and that therefore no legal settlement can be made without full consideration of her claims.

THREE ANGLO-DUTCH submarine telegraph cables —one extending between Lowestoft and Zandvoort, and two between Benacre and Zandvoort, have four conductors each and are operated with Hughes printing apparatus, and at times with Baudot double duplex apparatus.

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